PRELIMINARY REPORT

SOUTHERN FREEWAY

JAMES LICK MEMORIAL FREEWAY TO EMBARCADERO FREEWAY

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VIEW OF FREEWAY IN VICINITY OF SILVER AVENUE AND JAMES LICK MEMORIAL FREEWAY

PRELIMINARY REPORT AND PLANS

for

SOUTHERN FREEWAY

from

JAMES LICK MEMORIAL FREEWAY

to

EMBARCADERO FREEWAY

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Prepared for

THE CITY AND COUNTY OF SAN FRANCISCO

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Preliminary report and plans for Southern 1956.

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July 13, 1956

Mr. Sherman P. Duckel
Director of Public Works
City and County of San Francisco
City Hall
San Francisco 2, California

Dear Mr. Duckel:

In accordance with the requirements of our contract dated January 21, 1955, and certified February 3, 1955, we submit herewith our preliminary report and plans for the section of the proposed Southern Freeway in San Francisco extending from its intersection with the James Lick Memorial (Bayshore) Freeway near Alemany Boulevard to its terminus at the proposed Southern Crossing near the intersection of 23d and Tennessee Streets.

This portion of our assignment has been both interesting and challenging and we express the hope that the attached report will meet your expectations.

Our work has been facilitated materially by the splendid cooperation received from all affected parties. The City Engineer and his staff have rendered useful assistance and have furnished available data promptly. The staff of District IV of the State Division of Highways have been most cooperative, as have the staff of the State Division of San Francisco Bay Toll Crossings. The utility companies operating in the affected area have likewise rendered helpful and willing cooperation.

We are looking forward to your comments on this phase of our assignment in order that we may proceed with the detail plans and specifications of the project.

Very truly yours,

DE LEUW, CATHER & COMPANY

Charles E. De Leuw
President

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SUMMARY OF REPORT AND RECOMMENDATIONS

Progressively increasing traffic using completed freeway sections and anticipated changing traffic patterns caused by major new traffic routes, such as the proposed Southern Crossing, have caused the State Division of Highways and the City to modify the freeway plan for San Francisco from time to time. Heretofore, the State has designed and constructed all freeways in the City, but the project under consideration, although an important link in the freeway system, has not been adopted as a State Route. Therefore it is not under the jurisdiction of the State Division of Highways.

In order to accelerate San Francisco's freeway construction program and to prepare for demands which will be created by the construction of the State's portion of the proposed Southern Freeway west of the James Lick Memorial (Bayshore) Freeway, as well as of the Southern Crossing, the Director of Public Works, with the approval of the Chief Administrative Officer of the City, found it necessary to expedite the planning of the City's portion of the Southern Freeway between the James Lick Memorial Freeway and the proposed Southern Crossing with its adjunct, the Embarcadero (Tennessee) Freeway. The City's own engineering staff being preoccupied with other work, it was found advisable to employ De Leuw, Cather & Company, Consulting Engineers, to plan this project.

The portion of the Southern Freeway under consideration traverses the industrial area located between James Lick Memorial Freeway on the west, Third Street on the east, Industrial Street on the south, and Twenty-third Street on the north, in the approximate center of which is located the Marine Corps Supply Forwarding Annex. Terminal connections are required to the existing James Lick Memorial Freeway; to the terminus of the State's portion of the future Southern Freeway in the vicinity of Alemany Boulevard; and to the future Embarcadero Freeway and Southern Crossing as proposed by the Division of San Francisco Bay Toll Crossings.

The purpose of this report is to present for review, by the Department of Public Works of the City and County of San Francisco, a plan indicating the proposed location, alignment and grades, design features, and utility modifications of the section of the Southern Freeway under study, together with preliminary estimates of cost for this improvement. Typical sections, designed in accordance with the latest standards and criteria, are included in this report.

The plan herein presented has been prepared under the general direction of the Director of Public Works and the City Engineer, and in consultation with District IV, State Division of Highways, as well as with the State Division of San Francisco Bay Toll Crossings. The proposed freeway is designed to meet estimated traffic demands projected to 1980. The origin-destination data developed from the Bay Area Metropolitan Traffic Survey of 1946-1947, annual counts of the Division of Highways, and traffic counts furnished by the City, are used as the basis for the traffic estimates. Our studies indicate that the proposed improvement will be required regardless of the amount of traffic developed by the Southern Crossing and also that the improvement would even now serve a definite need.

The recommended alignment is selected because it entails the least disruption to existing property and provides the best alignment and the lowest cost of any practicable alternate route available. The route is the nearest possible to a direct line between the proposed reconstructed intersection of the James Lick Memorial Freeway with the Southern Freeway and the junction of the Southern Crossing and the Embarcadero Freeway. It traverses the Marine Corps Supply Forwarding Annex along Selby Street and intersects the Southern Pacific Company right-of-way at a point west of the Islais Creek Basin. In order to simplify connections to existing and proposed facilities, hold space requirements to a minimum, and minimize cost, a two-level, three-lane elevated structure of welded steel construction is proposed for the main route and its connection to the Embarcadero Freeway. Two-level, two-lane roadways are recommended for connection to the Southern Crossing, to the James Lick Memorial Freeway, and to the State's portion of the Southern Freeway. The freeway is designed for a maximum speed of sixty miles per hour, with 12-foot lanes and an extra two-foot shy-away distance at each curb line.

The plan recommended consists of 1.524 miles of two-level, three-lane and 0.765 mile of two-level, two-lane roadways.

The preliminary cost estimate of the facility under study follows:

Roadway and Structure	$11,055,000
Utility Modifications	742,000
TOTAL CONTRACT COST	$11,797,000
Engineering, Legal, and Administrative	1,767,000
Contingencies	2,355,000
TOTAL CONSTRUCTION COST	$15,919,000
Rights-of-Way	2,515,000
TOTAL COST	$18,434,000

The current geometric standards of the State Division of Highways and the Standard Specifications for Highway Bridges of the American Association of State Highway Officials have been followed in the design of this section of freeway. Specifications for H 20-S16 loadings have been followed. Application of these design standards to conditions peculiar to this project has been determined with the advice and agreement on the part of the engineering departments of the City and State.

The most feasible line between the termini of the project crosses the Marine Corps Annex, along Selby Street. Pending approval by the Marine Corps to traverse the Annex, an alternate line bypassing the Annex was studied. See Plate II. Any line north or south of Selby Street was found to require the crossing of either restricted areas or valuable property involving condemnation, with the resulting property tax losses. Permission was granted on July 21, 1955, to construct a viaduct along Selby Street, with certain restrictions that are neither costly nor difficult to meet. Consequently, further study was limited to the design of the freeway along this general alignment, with several modifications concerning the crossing or bypassing of the Islais Creek Channel and the connections at the termini.

At its westerly end the project will connect with the James Lick Memorial Freeway and that portion of the Southern Freeway which is under the jurisdiction of the State Division of Highways. At its easterly end it connects with the approach to the proposed Southern Crossing and to the Embarcadero Freeway now being designed by the State Division of San Francisco Bay Toll Crossings.

We understand that the construction of the Southern Freeway west of James Lick Memorial Freeway and the modifications of the James Lick Memorial Freeway south of the Southern Freeway will precede the construction of the project under consideration. It is therefore considered possible to construct the proposed project as indicated in this report, and no temporary connections to adjacent facilities are provided.

The program of construction of the Southern Crossing has, as yet, not been fixed, and the plan herein proposed may therefore require modification to provide on- and off-ramps at Third Street and at Tennessee Street. Such connections would be simple and their cost of relative small magnitude.

I INTRODUCTION

Phase I of the agreement with the City calls for the preparation of preliminary plans for the construction of that section of the proposed Southern Freeway in San Francisco, extending from the vicinity of Alemany Boulevard and San Bruno Avenue to the westerly terminus of the proposed Southern Crossing in the vicinity of Third and Twenty-fifth Streets, together with necessary ramps and connections to the James Lick Memorial (Bayshore) Freeway, the proposed Southern Crossing approaches, and the Embarcadero (Tennessee) Freeway. See Plate 1. These plans include:

Preliminary rights-of-way plans, alignment plans, and profiles;

Preliminary structural designs showing typical sections of structures and roadway;

Functional plans of interchanges;

Specific information on utility modifications;

Preliminary special provisions of the construction specifications;

Estimated costs of construction and of rights-of-way, including property damage and utility modification.

The portion of the Southern Freeway under consideration traverses a highly industrialized area, near the center of which is located the Marine Corps Supply Forwarding Annex. Because of the generally high cost of rights-of-way and the restrictions attending the crossing of the Marine Corps Annex, all but a relatively small length of the freeway and interchange connections will be an elevated structure. Hence, the determination of the most economical type of structure that best fits the requirements and conforms to present day standards is a matter of primary importance in this study.

II AVAILABLE DATA

Traffic

The origin-destination data developed for the Bay Area Metropolitan Traffic Survey of 1946-1947 were used as a basis for determining the pattern

of travel with one major exception. The area immediately southwest of the City virtually has attained its entire growth since the Bay Area Metropolitan Traffic Survey was conducted, so that the data collected at that time are not considered representative for that area at present. Therefore, the pattern of the adjacent Park Merced area was adopted in this study as being representative of the area directly south of the city limits.

Annual counts of the Division of Highways were available to provide information on the increase in traffic entering the City across the bridges and from the south. Cordon counts of the downtown shopping and financial districts, screen-line counts on a line west of Van Ness Avenue between Oak and California Streets, and screen-line counts on a line south of Sixteenth Street between Third Street and Dolores Street were available to provide information on the increase in internal traffic.

The City conducts vehicular volume counts regularly on all principal trafficways. Current data are available as to all-day and peak-hour traffic on these trafficways.

Information on population, vehicle registration, vehicle use, and future trends was studied. Plate III compares population, vehicle registration, and growth in traffic entering and leaving San Francisco.

Foundation Data

The results of test borings made in the vicinity of Alemany Boulevard and Bayshore Boulevard were furnished by the State Division of Highways. The Bureau of Engineering of the City and County of San Francisco supplied the logs of its water supply wells and test holes made in connection with the construction of its sewage treatment plant. It also furnished pile driving data for the structures built by the City and by the Southern Pacific Company in the vicinity of the proposed freeway.

From this information and a general knowledge of the geology of the area, together with experience gained in similar areas of the City, it was evident that there would be a large variation in the elevation of suitable foundation material along any chosen alignment. Hence, in order to obtain sufficient information on which to base a reasonably accurate preliminary estimate of cost, additional borings were considered necessary. The San Francisco Department of Public Works employed Hyde Forbes, Engineer and Geologist, Palo Alto, California, to perform additional subsurface investigations; the data obtained are described and discussed under "Engineering Studies."

Rights-of-Way Costs

The Real Estate Department of the City furnished appraisals of property required by the various alignment studies.

City Maps and Topographic Data

The Bureau of Engineering supplied the following data from its records or requested from other agencies:

City facilities:

Maps showing layout and dimensions of existing streets; proposed location of the Silver Avenue Junior High School; police, fire alarm, and traffic signal circuits; domestic and high pressure water lines; sewers, including the Alemany Boulevard extension and West Shore intercepting sewer; aerial photographs of the area pertinent to the study. Because of recent changes in topography of the high ground east of Bayshore Boulevard, a topographical survey was made by the City to determine existing conditions.

State controlled facilities:

Plans of James Lick Memorial Freeway in the vicinity of Alemany Boulevard; tentative plans of the State's Southern Freeway and its connections to the James Lick Memorial Freeway; tentative layouts for Southern Crossing connections to Army Street and the Embarcadero Freeway being designed by the Division of San Francisco Bay Toll Crossings; docks and wharves on Islais Creek Channel under the jurisdiction of the State Harbor Com mission.

Government-owned facilities:

Location of facilities within the Marine Corps Supply Forwarding Annex, including utilities on Selby Street.

Public utilities:

The Bureau of Engineering obtained the following information from the public utility companies concerned:

Pacific Gas and Electric Co. — location of existing and proposed facilities including gas lines, overhead lines, and underground duct lines.

The Pacific Telephone and Telegraph Co. — location of underground and overhead lines, required clearances and standards.

Southern Pacific Company — station plans, profiles of existing tracks, and clearance diagrams.

III DESIGN CRITERIA

Geometrics

The part of the Southern Freeway under study is but a link in the ultimate freeway system serving the City and County of San Francisco. As the adjoining sections are under the jurisdiction of the Department of Public Works of the State of California, it was considered advisable that the freeway under study be designed in accordance with the latest criteria of the State Division of Highways. Therefore the following standards were adopted:

Design speed	60 miles per hour
Minimum radius for horizontal curves	1150 feet
Grades	3% maximum
	0.25% minimum
Superelevation	.09 foot per foot, maximum
Rate of superelevation runoff	1:150
Superelevation runoff	2/3 of length on tangent
	1/3 of length on curve
Ratio of radii on compound curves	2:1
Tangent distance between reverse curves	400 feet, minimum
Stopping sight distance	475 feet, minimum
Lane width	12 feet
Shy-away distance (curb to lane edge)	2 feet
Clearances	
Vertical, over main line railroad tracks	24 feet, minimum
Vertical, over other railroad tracks	23 feet, minimum
Horizontal, centerline of tracks to near face of column or pier	10 feet, minimum

Datum

All elevations are based on City datum which is 8.606 feet above sea level (1929 General Adjustment). To convert elevations to State Division of Highways datum, add 11.704 feet and to convert elevations to Division of San Francisco Bay Toll Crossings datum, add 8.606 feet.

Structural Criteria

Members were proportioned for combinations of dead load, live load, earth pressure, impact, temperature stress, centrifugal force, longitudinal force, wind force, and seismic force.

In proportioning the various parts of the structure, provision was made for stresses corresponding to the following groups of applied loads:

Group A; dead load, live load, impact, centrifugal force, and earth pressure, for which the unit stresses specified were used.

Group B; dead load, earth pressure, and wind load, for which unit stresses may be increased 25%.

Group C; Group A plus longitudinal force due to live load and friction, plus 30% wind load on the structure, plus one-half wind load on the live load, for which unit stresses may be increased 25%.

Group D; Group A plus shrinkage, plus temperature, for which unit stresses may be increased 25%.

Group E; Group B plus shrinkage, plus temperature, for which unit stresses may be increased 40%.

Group F; Group C plus shrinkage, plus temperature, for which unit stresses may be increased 40%.

Group G; dead load, plus earth pressure, plus seismic force, for which unit stresses may be increased 33-1/3%.

A seismic coefficient of .06 was used for structures on piles and .02 for structures on spread footings.

The dead load consists of the weight of the structure, complete, including the roadway, sidewalks, pipes, conduits, cables, and other public utility services.

The live load conforms to AASHO H20-S16-44 loading. The live loads on the roadway, under the above designation, are based on a truck and semi-trailer loading composed of a 20-ton tractor unit followed by a 16-ton trailer axle, with load distributed 4 tons on the front axle and 16 tons on each of the other two axles. In the determination of total loading a truck and trailer is placed in each lane of roadway.

Reinforcing steel conforms to specification ASTM 305-50T for intermediate grade billet steel with allowable stress of 20,000 pounds per square inch. Structural steel for welding conforms to ASTM A373-54T. Concrete is considered as having an ultimate strength of 3,750 pounds per square inch.

IV ENGINEERING STUDIES

Traffic Estimates

The estimate of traffic which would use the proposed freeway and its connections was made in a joint study by the District Traffic Department of District IV, State Division of Highways, and De Leuw, Cather & Company.

Traffic was assigned to a network of freeways, illustrated on Plate IV, which is planned by the State and the City for the year 1980. Using the origin-destination data, volume counts, population information, and other data described in Section II of this report, expansion factors were developed and applied to the 1947 pattern of traffic movements to produce estimated 1954 and 1980 vehicular trips. These trips were then assigned to the assumed 1980 freeway network, employing the usual techniques for such studies based upon time and distance considerations.

Plate V illustrates the estimated 1980 average daily demand on the section of Southern Freeway under study and on the connecting freeways and ramps. As a matter of interest, Plate VI is presented to indicate the estimated vehicular demand if the entire 1980 freeway network were in operation in 1954. Plate VII illustrates the estimated 1980 peak-hour demand in one direction.

The vehicular volumes indicated on Plates V, VI, and VII are predicated upon the bases that the freeways would have adequate capacity to carry the vehicles assigned to them by the method used in this analysis and that the ramps and interchanges could be physically located so as to serve functionally the traffic assigned.

Adjustments to estimated vehicular volumes were necessitated by the following physical factors:

1. The saturation capacity of the James Lick Memorial Freeway north of Alemany Boulevard is 8,000 cars per hour in one direction.

2. The saturation capacity of the James Lick Memorial Freeway south of Alemany Boulevard is 6,000 cars per hour in one direction.

3. The required length of ramps connecting the Southern Freeway with the James Lick Memorial Freeway places the junction of these freeways south of Silver Avenue. Hence, northbound vehicles entering the freeway system at Silver Avenue must continue north on the James Lick Memorial Freeway. An analysis was made of the need for a connection to the Southern Freeway from the street in the vicinity of Silver Avenue, and it was estimated that only approximately five percent of the traffic using the Southern Freeway proper would be accommodated by the connection. Hence it is concluded that there is no economic justification for this connection.

4. The height of the lower deck of the Southern Freeway in the vicinity of Evans Avenue is 47 feet. The value of the property and the structure cost for the length of ramps necessary to reach the freeway from the street greatly exceed the benefits to be gained. As ramps planned for the Southern Crossing in the vicinity of Third and Army Streets and ramps planned for the Embarcadero Freeway in the vicinity of Nineteenth and Third Streets will accommodate the heavy northbound traffic originally assigned to the Evans Avenue interchange, the northbound ramp of this interchange was eliminated from the plan. Of the estimated 5,600 vehicles per day assigned to the southbound ramp of the Evans Avenue interchange, approximately 2,200 originated in the area of the Nineteenth Street interchange of the Embarcadero Freeway. On the basis of earlier studies it was considered that ramps to and from the north, only, were to be provided in the vicinity of Nineteenth Street. However, the so-called "Embarcadero Approach" of the Southern Crossing provides ramps to accommodate traffic to and from the south, and the 2,200 vehicles have been reassigned to these ramps. An estimated 2,300 vehicles would find the Army Street interchange of the James Lick Memorial Freeway almost as convenient to use. Of the remaining 1,100 vehicles per day, only approximately 700 may be considered to be forced to use an interchange less convenient than one located in the vicinity of Evans Avenue.

Taking into consideration the foregoing limitations and adjustments, an adjusted 1980 peak-hour flow in one direction was determined. This is indicated on Plate VIII. Based upon a practical capacity of 1,500 vehicles per lane per hour, three lanes in each direction are required along the freeway proper to a point where it meets the Embarcadero Freeway. Two lanes in each direction are required for the connection to the portion of the Southern Freeway west of James Lick Memorial Freeway. As the peak-hour volume of traffic on the connection between James Lick Memorial Freeway and Southern Freeway is almost 1,500 cars in one direction, it appears prudent to provide two lanes in each direction at the outset.

It has been established that the portion of the Southern Freeway under study is an essential link in the 1980 freeway network. Plate VI indicates that if the 1980 network were in operation in 1954 the Southern Freeway would carry 27,000 vehicles per day, or approximately 1,900 in one direction during the peak hour. The question was raised as to the desirability of constructing this freeway link prior to the time that the complete network is constructed. For purposes of analysis it is assumed that this portion of the freeway can be completed and in operation by 1960.

Using the peak-hour traffic flow developed by the City for the period 1953-1955 and annual counts of the Division of Highways as a basis, the following further assumptions were made:

1. Vehicular volumes in 1960 would be 10% higher than the 1953-1955 level.

2. The practical capacity of 1,500 vehicles per lane per hour will not be exceeded on the portion of the James Lick Memorial Freeway north of Alemany Boulevard.

3. The easterly connection of the Southern Freeway will consist of a connection to the Embarcadero Freeway or ramps to Third Street if that freeway is not constructed by 1960.

4. At the westerly end of the freeway there will be a connection to the James Lick Memorial Freeway and a crossing of that freeway to either Alemany Boulevard or to a continuation of the Southern Freeway.

Plate IX indicates the estimated 1960 peak-hour flow in one direction based upon the foregoing assumptions. In our opinion the volume of 3,500 vehicles during the peak hour is conservative. It may be expected that, other factors being equal, drivers will select routes so as to equalize the lane usage of the Southern Freeway and the James Lick Memorial Freeway. Hence, more than the 3,500 vehicles may be expected on the Southern Freeway and less than 6,000 vehicles on the James Lick Memorial Freeway. It is concluded, therefore, that the Southern Freeway and connections should be built now.

Location Studies

The terminal connections of the proposed Southern Freeway so control its general location that a direct line between them passes through the Marine Corps Supply Forwarding Annex. It was understood from the beginning that if permission to cross the Annex was granted it could be only for a line along either Toland Street or Selby Street. To avoid crossing the Annex a study was made to determine if a line to the north of it was practicable. Although several variations of such a line were tried out, it was found impracticable to locate the line so that the terminal connections would conform to the desired geometric standards. It was also found that it would be necessary to take property that was costly and to move or reconstruct existing facilities. A freeway built along Toland Street would involve fewer complications than one built along Selby Street. However, such a line would involve the taking of much newly established industrial property, including the Apparel City.

Having established the desirability of constructing the proposed freeway along Selby Street, permission to do so was requested by the City on March 28, 1955. At that time a single-deck, six-lane viaduct was proposed, having an over-all width of 89'-8" and leaving a space of

approximately 5-1/2 feet between the structure and the adjoining warehouses. Vertical clearance over the street and the railroad tracks was to be 23 feet. An 8-foot chain link security fence was to be constructed along each side of the viaduct roadway, lights were planned under the viaduct floor to light the street where required, and existing utilities were to be carried, if necessary, along the structure in ducts. It was planned that during construction a temporary fence would be built along the easement line and access to the Annex would be under the control of the Marine Corps. It was pointed out that the studies showed that a line along Selby Street provided the best alignment and grades for a freeway between the established terminals, required taking a minimum of improved property, and would not interfere with the use of Selby Street.

In a letter dated June 27, 1955, the City informed the Marine Corps that it understood that permission had been granted by the Twelfth Naval District Public Works Officer to build the viaduct along Selby Street as requested and that an agreement was being prepared. In the meantime our studies indicated that a double-deck structure was preferable to a single-deck. It would be necessary to maintain column spacing of 51'-4", center to center, because of the existing sewer line along the center of the street. The over-all width of the decks was reduced to approximately 46 feet, but the original easement of 92 feet was requested in order to provide space for column footings and utilities.

Tentative approval for a line along Selby Street having been obtained, further studies were devoted to that general location. At the west terminus of the project two alignments were considered; the first was on a prolongation of the present alignment of Alemany Boulevard and the second a proposed alignment further south, taking advantage of the high ground east of the James Lick Memorial Freeway. Our studies of these lines in cooperation with the State Division of Highways resulted in general acceptance of the southerly line. Further detailed studies were made of the connections to this line to determine an alignment having the best geometric standards consistent with a minimum of damage to adjacent property, which is largely residential.

Northeast of the Marine Corps Forwarding Annex a direct line crosses the Islais Creek Channel near its upper end. At this point a structure across the channel would interfere with the docking of ships at the copra unloading dock of Cargill, Inc. (Pier No. 84) and would require moving the barge unloading facilities of The Texas Company, chiefly because of the fire hazard. Seven to ten vessels per month discharge copra at the Cargill wharf. These vessels are usually the Mariner type, and the prow of the vessel would project under the proposed viaduct. The highest part of the vessel to be considered is the king post, which extends 95 feet above the water line and requires a vertical clearance of at least 100 feet. An alignment bypassing the channel requires two additional curves, but the design standards adopted for the project can be adhered to and the con-

struction of the freeway on this alignment is less costly, both as to structure and property damage, than the alignment crossing the channel. Hence, the alignment bypassing the channel was adopted.

The northern portion of the alignment having been determined, it was then possible to study the detailed geometric layout of a connection with the Southern Crossing interchange, which is under the jurisdiction of the State Division of San Francisco Bay Toll Crossings. Although the preparation of detailed layouts of the connection must await the completion of studies by the State Division of San Francisco Bay Toll Crossings with regard to the Southern Crossing and its connecting freeways, it has been determined that practicable connections are possible and modifications of tentative layouts should not materially affect the preliminary designs and cost estimates.

Geology and Foundations

The report, Investigation of Ground and Water Conditions in Relation to Foundation Treatment, Proposed Southern Freeway, San Francisco, California, prepared by Hyde Forbes, Consulting Engineering Geologist, dated June 28, 1955, was received on July 1, 1955.

As stated in the Forbes report, the bedrock complex of the San Francisco Peninsula is the oldest formation found on the coast, and no superimposed formations have been noted. The bedrock has been subjected to intrusion by igneous magma, metamorphosis, weathering, and erosion for millions of years. Seismic action has caused much shearing and faulting.

Following the glacial epoch the melting glaciers gradually raised the ocean level over a period of some 40,000 years, and the rising waters inundated the valleys and formed tidal marshes and peat bogs at successive levels along the shoreline. As a result the bedrock along the bay shoreline is overlain by considerable depths of estuary and tidal clays, blue and odorous from rotting vegetation, all referred to by drillers as "bay mud." Much of the area along the shore has been filled in during recent years with waste material, much of which is rocky.

The Franciscan rock that is first encountered in the test holes is weathered and leached of its cementing matter and weakened by joint openings. The depth below the surface of the rock to rock that is considered suitable for a recommended load of 50 tons per square foot varies between 5 and 20 feet. (A minimum dry density of 160 pounds per cubic foot is considered sufficient to support a load of 50 tons per square foot.) Material encountered near the top of the bedrock in the shallower holes is considered capable of supporting a load of 20 tons per square foot, but at depths greater than about 100 feet other material considered capable of withstanding this load often occurs well above the rock line. The maximum depth to the rock along Selby Street alignment is about 175 feet

below the ground line (in the vicinity of Jerrold Avenue); but on the higher ground in the vicinity of Bayshore Boulevard, it occurs practically at the surface.

The borings made during May and June 1955, by Hyde Forbes at seventeen locations were all carried to bedrock. This work required 1,635 feet of test hole, from which 97 samples of material were taken. A rotary drill rig and a fishtail bit were used to reach the bedrock, and a Hughes Rock Bit was used in penetrating the rock to the point where a bearing value of 50 tons per square foot was indicated from the samples. A cable tool rig was necessary to penetrate the filled-in material and the holes had to be cased; it was found that much heavy material, such as iron, had sunk in the mud to considerable depths.

It is evident from the geology and the logs of borings that most of the viaduct footings require pile foundations. The spread footings on the higher ground and the shorter pile foundations near it present no problem, and the probable deviations from estimated depths are of minor importance for a preliminary estimate. However, the design of the long pile foundations materially affects the structure design and its cost, and requires careful study. From the nature of the material encountered in the test holes and from experience in other projects with like foundation conditions on the San Francisco Peninsula, it is felt that such pile foundations can be conservatively designed for a loading of 45 tons per pile under dead and live load, increasing the allowable load to 56 tons per pile when wind load is added, and to 60 tons per pile when seismic stress is added.

In order to estimate the cost of the foundations it is necessary to determine the length of pile required, which involves an estimate of the probable penetration required to obtain safe bearing value. For piles driven to bedrock, steel H-pile or pipe piles may be expected to penetrate the rock a matter of from 5 to 15 feet before the rate of penetration indicates a safe bearing value. Where rock is 100 feet or more below the surface, dense layers of sand or sand and clay, of sufficient thickness to provide safe bearings, are encountered at some distance above the rock. Tests of the material, including the dry weight, cohesion value, and rate of penetration, afford a fair basis for estimating the probable length of the piles for preliminary cost purposes. In the final analysis these lengths will be checked by loading a number of test piles. Test borings indicate that piles will vary in length from 20 feet to 110 feet and that the average length will be approximately 70 feet.

Economic Considerations

Practically all of the Southern Freeway included in this study will be carried on viaduct and, consequently, an investigation of the relative merits of all practicable designs and types of structure is a matter of

primary importance. Studies were made of single- and double-deck viaduct, various span lengths, and designs using structural steel, reinforced concrete, and prestressed concrete.

A practicable layout for a single-deck viaduct with the necessary terminal connections was achieved. This design conformed to the required minimum standards, except for a narrower-than-standard median strip, and involved no serious right-of-way difficulties. However, it was found that the State Division of San Francisco Bay Toll Crossings favored a double-deck viaduct for the Embarcadero Freeway and the State Division of Highways contemplated using that type of structure for the portion of the Southern Freeway west of James Lick Memorial Freeway. Therefore, a double-deck viaduct will have simpler connections with the adjoining freeway sections; and with its natural advantages of less right-of-way and somewhat lower construction cost under most conditions, the double-deck viaduct proves to be more economical than single-deck for this project. Fewer footings for equivalent deck areas and a reduction in deck area by omitting the median strip contribute to the lower cost of double-deck construction. Following its adoption, detailed design studies and computations were confined to the double-deck type of viaduct.

The length of the spans for the freeway viaduct is governed to a large extent by the horizontal and vertical clearances required in crossing streets and railroad industrial tracks, avoiding structures, and by the desirability of maintaining uniform span lengths in the structure between these control points. However, in order to determine the economical span length for those portions where a choice was possible, the relative costs of a 56-foot, a 70-foot, and a 90-foot double-deck, steel span and one steel bent were estimated. The following costs per lineal foot of structure were developed, using present day average unit prices:

Span lengths:	56'	70'	90'
Cost per lineal foot:	$897	$931	$996

Although these costs will vary to some extent with the unit prices and other conditions that may prevail when the project is built, the differences are sufficient to indicate that span lengths somewhat under 60 feet should be used where practicable.

Weighing the advantages of steel or reinforced concrete viaduct construction requires consideration of clearances, handling of traffic during construction, and the availability of materials at the time of construction. In order to determine the most satisfactory type of structure specifically applicable to the section between Revere Avenue and Evans Avenue, where conditions impose no restrictions requiring special design, the relative costs of the following types of double-deck viaduct were estimated:

1. Reinforced concrete footings and bent; prestressed concrete superstructure.

2. Reinforced concrete footings and bent; box girder superstructure.

3. Reinforced concrete footings and bent; steel girder superstructure.

4. Reinforced concrete footings; steel bent; steel girder superstructure.

In comparing the cost of these four structure types, unit prices slightly higher than present bid prices were used. The increase in price seems justified because of recent increases in the base prices of construction materials. Because the length of span will vary between 56 feet and 90 feet, a span length of 70 feet was assumed in preparing the comparative estimate. The comparative costs of the four types of structure enumerated are as follows:

Item	Estimated Cost per lineal foot of viaduct			
	(1)	(2)	(3)	(4)
Pile footings	$384	$384	$283	$163
Bent	197	197	187	145
Superstructure	510	452	579	577
Painting	1	1	33	46
TOTAL	$1092	$1034	$1082	$931

Under normal conditions, which appear probable during the next few years, the all-steel viaduct (No. 4) is apparently the lowest in first cost. However, structural steel in this area is subject to a considerable cost annually to take care of painting, which cost is over and above the usually rather nominal costs for maintenance and repairs common to both steel and reinforced concrete structures. To keep the cost of repainting to a minimum on a double-deck viaduct of considerable length, sufficient clearance for a traveling platform should be provided, particularly under the upper deck. With such a provision it is estimated that the annual cost of maintenance painting will amount to about $5.00 per ton of steel, resulting in an annual cost per foot of approximately $4.05 for the steel and reinforced concrete viaduct (No. 3) and approximately $6.75 for the all-steel viaduct (No. 4). Capitalizing these annual costs over a 50-year period at 5% increases the cost per foot by $74.00 and $123.00, respectively.

Adding the capitalized painting cost to the cost of construction raises the cost of an all-steel viaduct above that of the reinforced concrete box girder type (No. 2), under the particular assumptions made

as to relative unit prices. However, the choice of type should be predicated also on factors other than first cost of construction and maintenance of a typical structure of uniform span length. On the portion of the freeway north and east of Evans Avenue conditions in a number of places require longer spans than was found to be the economical length. Crossings of several streets and the main line of the Southern Pacific Company at various angles require odd span lengths and skewed and irregularly shaped bents. Non-typical construction is required also where the freeway crosses the large storm sewer in the vicinity of Selby and Napoleon Streets and at the connections with the Embarcadero Freeway and Southern Crossing.

During construction, maintenance of traffic under and alongside the work area is a primary consideration. At such points as street and railroad crossings and along Selby Street through the Marine Corps Supply Forwarding Annex, steel girder or other prefabricated girder construction is essential. Also, at several other points continued construction operations at the ground level or above will hamper and endanger adjacent industrial and commercial facilities. Finally, the vibration of pile driving in the soft material that underlies a considerable portion of the project could result in damage to adjacent structures. Hence, it is advisable to keep the amount of pile driving to a minimum and to take special precautions where such work must be done. Prefabrication, restricted clearances, a minimum of pile driving, and great variety in design favor the use of an all-steel type of construction.

South and west of Revere Avenue to its junction with the James Lick Memorial Freeway and the State Southern Freeway the lower roadway of the freeway is largely in cut or on fill and the upper roadway is a single-deck viaduct. In this case the economical span length would be somewhat shorter than that of the double-deck structure because of the lower cost of foundations.

V RECOMMENDED PROJECT

General Features

The general location and design features recommended for adoption on this section of the Southern Freeway have been discussed in the previous sections of the report. Reasons have been given for choosing the recommended location, standards of alignment, widths of roadway, and type of structure to be used in general throughout the project. In this section of the report and the accompanying plans their application to the project will be described in more detail.

Broadly speaking, the section of freeway under consideration is that portion of the Southern Freeway which connects the portion to be built

generally along the line of Alemany Boulevard, west of the James Lick Memorial Freeway, with the proposed Embarcadero Freeway in the vicinity of Twenty-third Street. Included are connections to the James Lick Memorial Freeway to the south and to the proposed Southern Crossing. For the purpose of more detailed discussion the project is divided into the following sections:

1. The main trunk section which extends from the junction of the two westerly legs which connect with the Alemany Boulevard section of the Southern Freeway and the James Lick Memorial Freeway, respectively, to the junction of the two easterly legs which connect with the Embarcadero Freeway and the Southern Crossing, respectively. The west junction is located a short distance east of the intersection of Elmira and Helena Streets; the east junction is located near the intersection of Twenty-sixth Street and Indiana Street.

2. The westerly terminal connections with the Alemany Boulevard section of the Southern Freeway and the James Lick Memorial Freeway. It is recommended that project construction on the Alemany Boulevard leg terminate at the west line of Boutwell Street and on the James Lick Memorial Freeway connection terminate at its junction with the State's James Lick Memorial-Alemany Boulevard connection, south of Silver Avenue.

3. The easterly terminal connections with the Embarcadero Freeway and the Southern Crossing. It is recommended that both legs of the project terminate at their respective junctions with the Southern Crossing-Embarcadero Freeway connections in the vicinity of Third Street and Twenty-fifth Street.

Main Trunk Section

The main trunk section of the freeway between junctions is approximately 6,547 feet in length. Approximately 3,700 feet are located along Selby Street, of which about 2,200 feet are within the limits of the Marine Corps Supply Forwarding Annex. This portion of the freeway will consist of typical double-deck viaduct with ample horizontal and vertical clearances over the cross streets and railroad tracks, between Revere and Evans Avenues. At Evans Avenue the freeway turns northward on a 1,170-foot radius curve and runs adjacent, and approximately parallel, to the Southern Pacific Company's right-of-way. It then turns on a 1,258-foot radius curve and crosses the tracks on a flat angle (approximately 21 degrees with the tracks) at a point about 200 feet north of Marin Street. From the crossing it continues in a northeasterly direction on tangent to the junction of the easterly legs. The two curves,

at Selby Street and at the railroad crossing, were necessary in order to avoid crossing the Islais Creek Channel, as has been previously discussed. It has also been pointed out previously that certain conditions, including the storm sewer and the crossing of the railroad on this portion of the freeway, make it necessary to depart from the typical viaduct design so far as span lengths and layout of bents are concerned. The flat-angle crossing of the railroad, with provision for two additional tracks in the future, complicates the design of the structure, but revision of the alignment to improve the angle of crossing would involve costly rights-of-way and property damage that presently do not seem justified. Based on the estimates of future traffic, discussed in Section IV, two three-lane roadways are recommended for the main trunk section of the freeway, the upper roadway for westbound and southbound traffic, and the lower deck for northbound and eastbound traffic.

Westerly Connections

The two westerly legs connecting with the Alemany Boulevard section of the Southern Freeway and the James Lick Memorial Freeway have double-deck roadways, but since they both cross the higher ground east of Bayshore Boulevard, supporting the lower roadway on cut or fill is found to be the more economical design. While the length of roadway on fill is very nearly the same as that in cut, there are roughly 68,000 cubic yards of excess material to be used beyond the limits of the project. It was found to be impracticable to balance the quantities and obtain the required standard of alignment and grades for clearances at the intersections. The recommended alignment at this terminus requires major revisions in the present connections to Alemany Boulevard and in the northbound lanes of the James Lick Memorial Freeway. These changes occur on portions of present or projected freeways under the jurisdiction of the State Division of Highways, which has indicated acceptance of the features of the recommended location. Based on estimates of future traffic, two two-lane roadways on each leg of the connections are recommended.

The roadway widths, curbs, and parapets used on the double-deck viaduct are maintained throughout the lower roadway section whether in cut or on fill. The lower roadway will consist of an 8-inch concrete pavement on a 4-inch cement-treated base and 12-inch graded rock subbase. The upper roadway will be supported by a single-deck viaduct on spread or pile footings as the subsoil conditions in cut or on fill may require.

The leg of the freeway connecting with the Alemany Boulevard section of the Southern Freeway is approximately 875 feet long and is on a 3,914-foot radius curve. The leg connecting with the James Lick Memorial Freeway to the south is approximately 1,915 feet long, of which 1,486 feet are on a 1,162-foot radius curve and the rest on tangent except for a slight curvature at the junction.

Easterly Connections

The leg which connects with the Embarcadero Freeway is approximately 1,500 feet long and is on a 1,379-foot radius curve. It is all on double-deck viaduct, with span lengths varying from 54 to 78 feet in order to fit the property lines and railroad track crossings to the best advantage. Based on the expected 1980 traffic a three-lane roadway on each of the decks of the viaduct is recommended. The leg which connects with the Southern Crossing interchange is approximately 1,250 feet long and is on a 1,164-foot radius curve. It also consists of a double-deck viaduct, but a two-lane roadway on each deck appears to be sufficient for the expected future traffic.

The layout and design of these two legs conform to the layout of the Southern Crossing interchange which is now being studied and designed by the State Division of San Francisco Bay Toll Crossings. In case the final design of the interchange differs from that now under study, some modification of the alignment and design of this connection may be necessary.

Right-of-Way Fencing

The basic right-of-way width is 80 feet for the two-lane viaduct, and 100 feet for the three-lane viaduct. Additional width is required for cut and fill slopes, and some variations in width have been made in order to adjust the lot severances.

The approximate over-all width of the two-lane deck is 34 feet, and the three-lane deck 46 feet. The out-to-out width of column bases is approximately 48 feet and 63 feet, respectively. These dimensions provide lanes of approximately 16 feet and 18 feet clear width, respectively, between the column bases and the right-of-way line on each side. This space can be used for utilities or for passage if space under the viaduct is used for special purposes. The distance between the edge of the deck and the property line, being approximately 7 feet greater, affords added protection from fire or accident.

A standard 6-foot chain link fence will be erected along all property lines, except for the portion of freeway through the Marine Corps Supply Forwarding Annex. Gates will be located where entrance to the right-of-way is needed for maintenance or for other purposes.

As a security measure a standard 7-foot chain link fence, surmounted by barbed wire, will be erected on the parapet walls of both decks of the viaduct on the section through the Annex.

Before construction begins, a temporary chain link fence will be built along the easement lines through the Annex. This fence will connect

with the existing boundary fence and gates will be placed at certain street and railroad track crossings. The portion of the existing boundary fence across the proposed right-of-way will be removed temporarily and entrance from the right-of-way to the Annex will be under the control of the Marine Corps at all times. Upon completion of the project through the Annex the temporary fence and gates will be removed for use elsewhere as permanent right-of-way fencing, and the boundary fence will be replaced in its original location.

Public Utility and Miscellaneous Work

When a freeway is constructed through a developed area, particularly an industrial area, the route location and the design should be selected so as to cause as little interference as possible with important public utility and service facilities. As interference with the operation of certain utilities is costly, construction work must be planned to safeguard against interruption of service or provision must be made for temporary or permanent relocation of facilities ahead of the construction work.

The most important subsurface facilities affecting the alignment of the freeway are the City's Alemany storm sewer and the 110 KV somastic cable line of the Pacific Gas and Electric Company. The design of the freeway provides sufficient clearance for safe construction work if reasonable care is exercised. Other cases requiring modification of existing facilities or special precautions during construction are indicated on the exhibits included in this report.

VI ESTIMATE OF COST

As as preliminary to the development of the estimate of cost, the work was divided into 56 various items and the quantities of each item were computed. The unit and lump sum prices applied to the items cover labor, materials, tools, plant, and other incidental and overhead costs. Unit costs used in the estimate were developed after an analysis of topography and subsurface conditions, current costs of labor and materials prevailing in this area, accessibility of various portions of the project, and recent bid prices for similar items of work. Recent increases in the mill price of steel and other construction materials were taken into consideration.

Estimates of rights-of-way and property damage costs are based on preliminary appraisals made by the Real Estate Department, City and County of San Francisco. The estimates include not only the cost of the acquisition of the land and buildings on the properties to be acquired, but also all severance damages and damages to remainders.

Legal and administrative expenses cover the salaries and expenses of the City including administrative, accounting, legal and other personnel, and all costs incidental to the acquisition of right-of-way. Engineering costs include all expenses incurred for final surveys, investigations of subsurface conditions, borings and soil tests and their analyses, the preparation of contract documents, the analysis of bids, the checking of shop drawings, the inspection of all construction work, the coordination and scheduling of all construction contracts,—in short, all engineering services necessary to the undertaking.

Since it is expected that the contract for construction of this facility will be let within a short period of time it appears reasonable to assume that the costs of the various items will not change materially. However, unforeseen local or national conditions could affect the availability of certain construction materials, which in turn could influence the cost of the project. A continued tendency toward increased cost of steel construction may require a modification in design, particularly if the price differential favors reinforced concrete construction.

A summary of the estimates of cost and detailed estimates for each of the three sections of the project are presented on the following pages.

SUMMARY OF ESTIMATES OF COST

Construction Cost	
Trunk Freeway - Boutwell Street to 23d Street	$ 8,889,000
Interchange to James Lick Memorial Freeway	1,417,000
Interchange to Southern Crossing	749,000
Utility Modifications	742,000
ESTIMATED TOTAL CONSTRUCTION COSTS	$11,797,000
Rights-of-Way, Property Damage, Etc.	2,515,000
Legal, Administrative, and Engineering - 15%	1,767,000
Contingencies - 20%	2,355,000
ESTIMATED TOTAL PROJECT COST	$18,434,000

PRELIMINARY DETAILED ESTIMATE OF COST
TRUNK FREEWAY - STATION 23+26.69 to 112+49

	Quantity	Unit	Unit Price	Amount
Grading & Drainage				
Clearing Rights-of-Way		l.s.		$ 2,500
Roadway Excavation	66,200	c.y.	1.35	89,370
Develop Water Supply		l.s.		2,500
Roadway Drainage		l.s.		39,178
Remove Existing Buildings		l.s.		10,000
Sidewalk, Curb & Pavement Removal	4,485	s.y.	1.35	6,055
Ditch Paving	1,230	l.f.	1.00	1,230
Landscaping		l.s.		10,000
Subtotal				$ 160,833
Roadway Pavement				
8" P.C.C. Pavement	4,860	s.y.	5.00	24,300
4" Cement Treated Subgrade	4,860	s.y.	1.10	5,346
12" Untreated Rock Base	2,700	ton	2.50	6,750
Concrete Curb-Parapet	563	c.y.	45.00	25,335
Reinforcement Steel	56,000	lb.	0.125	7,000
Subtotal				$ 68,731
Structures				
Structural Excavation	12,900	c.y.	2.50	32,250
Structural Backfill	7,150	c.y.	3.75	26,812
Crushed Stone Drains	621	ton	2.50	1,553
Class "A1" Concrete	8,760	c.y.	45.00	394,200
Class "B" Concrete	23,800	c.y.	55.00	1,309,000
Reinforcement Steel	4,222,300	lb.	0.125	527,788
Furnish Steel Piling:				
12" BP 53	71,400	l.f.	3.50	249,900
14" BP 73	90,100	l.f.	4.82	435,282
Drive Steel Piles	161,500	l.f.	1.00	161,500
Steel Pile Splices	1,200	ea.	35.00	42,000
Test Piles - Furnish and Drive	12	ea.	1500.00	18,000
Structural Steel - Bents	9,148,000	lb.	0.17	1,555,160
Structural Steel - Girders	17,501,000	lb.	0.175	3,062,675
Miscellaneous Steel	189,300	lb.	0.35	66,255
Clean & Paint Structural Steel	268,000	cwt.	1.55	415,400
Bridge Railing	37,070	l.f.	4.50	166,815
Deck Drains	90	ea.	90.00	8,100
Deck Drains - Leaders & Fittings	3,800	l.f.	5.20	19,760
Rubber Water Stops	12,000	l.f.	1.80	21,600
Freeway Lighting		l.s.		59,500
Subtotal				$8,572,550

PRELIMINARY DETAILED ESTIMATE
OF COST - TRUNK FREEWAY (CONTINUED)

	Quantity	Unit	Unit Price	Amount
Miscellaneous Construction				
84" Chain Link Fence (temporary)	4,240	l.f.	2.85	$ 12,084
84" Chain Link Fence on Viaduct	4,660	l.f.	2.85	13,281
84" Chain Link Fence - Salvage and Reinstall	4,000	l.f.	1.50	6,000
72" Chain Link Fence - Right-of-Way	13,800	l.f.	2.10	28,980
Gate - Temporary and Permanent		l.s.		4,600
Sign Frames and Supports	13,000	lb.	0.35	4,550
Replace Concrete Curb	730	l.f.	2.25	1,643
Replace Concrete Sidewalk	1,080	s.y.	3.50	3,780
Replace Pavement	2,400	s.y.	5.00	12,000
Subtotal				$ 86,918
Utility Modifications				
Electrical Transmission and Distribution Lines in USMC Annex		l.s.		$ 205,000
Electrical Transmission and Distribution Lines - Other		l.s.		329,300
Telephone & Telegraph Lines in USMC Base		l.s.		11,800
Telephone & Telegraph Lines - Other		l.s.		6,350
Railroad Signal & Communication Lines		l.s.		10,500
Police and Fire Alarm		l.s.		1,000
Water Lines, Domestic - In USMC Annex		l.s.		22,300
Water Lines, Domestic - Other		l.s.		3,100
Water Lines, High Pressure		l.s.		1,100
Gas Distribution Main - In USMC Annex		l.s.		200
Gas Distribution Main - Other		l.s.		18,700
Sewer Lines - In USMC Annex		l.s.		8,700
Sewer Lines - Other		l.s.		50,700
Subtotal				$ 668,750
ESTIMATED COST OF CONSTRUCTION, INCLUDING UTILITY MODIFICATIONS				$9,557,782

PRELIMINARY DETAILED ESTIMATE OF COST
JAMES LICK INTERCHANGE - STATION 101+33 to 120+48.28

	Quantity	Unit	Unit Price	Amount
Grading & Drainage				
Clearing Right-of-Way		l.s.		$ 2,500
Roadway Excavation	55,500	c.y.	1.35	74,925
Develop Water Supply		l.s.		2,500
Roadway Drainage		l.s.		19,300
Remove Existing Buildings		l.s.		10,000
Sidewalk, Curb & Pavement Removal	2,082	s.y.	1.35	2,811
Ditch Paving	1,310	l.f.	1.00	1,310
Landscaping		l.s.		7,000
Subtotal				$ 120,346
Roadway Pavement				
8" P.C.C. Pavement	3,344	s.y.	5.00	$ 16,720
4" Cement Treated Subgrade	3,344	s.y.	1.10	3,678
12" Untreated Rock Base	1,980	ton	2.50	4,950
Concrete Curb-Parapet	571	c.y.	45.00	25,695
Reinforcement Steel	77,100	lb.	0.125	9,638
Subtotal				$ 60,681
Structures				
Structural Excavation	1,680	c.y.	2.50	$ 4,200
Structural Backfill	640	c.y.	3.75	2,400
Crushed Stone (Drains)	42	ton	2.50	105
Class "A1" Concrete	1,758	c.y.	45.00	79,110
Class "B" Concrete	3,360	c.y.	55.00	184,800
Reinforcement Steel	545,500	lb.	0.125	68,188
Furnish Steel Piling - 12 BP 53	7,390	l.f.	3.50	25,865
Drive Steel Piles	7,000	l.f.	1.00	7,000
Test Piles - Furnish and Drive	4	ea.	1500.00	6,000
Structural Steel (Bents)	868,500	lb.	0.17	147,645
Structural Steel (Girders)	3,277,000	lb.	0.175	573,475
Miscellaneous Steel	20,800	lb.	0.35	7,280
Clean and Paint Structural Steel	41,400	cwt.	1.55	64,170
Bridge Railing	7,880	l.f.	4.50	35,460
Deck Drains	16	ea.	90.00	1,440
Deck Drain Leaders & Fittings	500	l.f.	5.20	2,600
Rubber Water Stops	1,700	l.f.	1.80	3,060
Freeway Lighting		l.s.		13,000
Subtotal				$1,225,798

PRELIMINARY DETAILED ESTIMATE OF COST
JAMES LICK INTERCHANGE - (CONTINUED)

	Quantity	Unit	Unit Price	Amount
Miscellaneous Construction				
72" Chain Link Fence - Right-of-Way	2,855	l.f.	2.10	$ 5,996
Gates - Salvage and Install	10	ea.	50.00	500
Replace Concrete Curb	80	l.f.	2.25	180
Replace Concrete Sidewalk	87	s.y.	3.50	305
Replace Pavement	678	s.y.	5.00	3,390
Subtotal				$ 10,371
Utility Modifications				
Electrical Transmission and Distribution Lines		l.s.		$ 22,600
Telephone and Telegraph Lines		l.s.		2,220
Water Lines, Domestic		l.s.		2,400
Sewer Lines		l.s.		9,700
Police and Fire Alarm		l.s.		350
Gas Distribution		l.s.		6,400
Subtotal				$ 43,670
ESTIMATED COST OF CONSTRUCTION, INCLUDING UTILITY MODIFICATIONS				$1,460,866

PRELIMINARY DETAILED ESTIMATE OF COST
SOUTHERN CROSSING INTERCHANGE - STATION 97+50 to 110+00

	Quantity	Unit	Unit Price	Amount
Grading & Drainage				
Clearing Right-of-Way		l.s.		$ 1,000
Roadway Drainage		l.s.		6,700
Remove Existing Buildings		l.s.		1,000
Sidewalk, Curb & Pavement Removal	50	s.y.	1.35	68
Subtotal				$ 8,768
Structures				
Structural Excavation	720	c.y.	2.50	1,800
Structural Backfill	360	c.y.	3.75	1,350
Class "A1" Concrete	560	c.y.	45.00	25,200
Class "B" Concrete	2,175	c.y.	55.00	119,625
Reinforcement Steel	346,800	lb.	0.125	43,350
Furnish Steel Piling				
12 BP 53	3,520	l.f.	3.50	12,320
14 BP 73	20,000	l.f.	4.82	96,400
Drive Steel Piles	23,000	l.f.	1.00	23,000
Steel Pile Splices	290	ea.	35.00	10,150
Test Piles - Furnish and Drive	8	ea.	1500.00	12,000
Structural Steel (Bents)	742,700	lb.	0.17	126,259
Structural Steel (Girders)	1,119,300	lb.	0.175	195,878
Miscellaneous Steel	17,700	lb.	0.35	6,195
Clean and Paint Structural Steel	18,000	cwt.	1.55	27,900
Bridge Railing	4,160	l.f.	4.50	18,720
Deck Drains	12	ea.	90.00	1,080
Deck Drain Leaders & Fittings	750	l.f.	5.20	3,900
Rubber Water Stops	1,122	l.f.	1.80	2,020
Freeway Lighting		l.s.		8,500
Subtotal				$ 735,647
Miscellaneous Construction				
72" Chain Link Fence - Right-of-Way	2,000	l.f.	2.10	4,200
Gates - Salvage and Install	4	ea.	50.00	200
Replace Concrete Curb	80	l.f.	2.25	180
Replace Concrete Sidewalk	20	s.y.	3.50	70
Replace Pavement	30	s.y.	5.00	150
Subtotal				$ 4,800

PRELIMINARY DETAILED ESTIMATE OF COST
SOUTHERN CROSSING INTERCHANGE - (CONTINUED)

	Quantity	Unit	Unit Price	Amount
Utility Modifications				
Electrical Transmission and Distribution Lines		l.s.		$ 25,000
Sewer Lines		l.s.		4,650
Subtotal				$ 29,650
ESTIMATED COST OF CONSTRUCTION, INCLUDING UTILITY MODIFICATIONS				$ 778,865

VII ACKNOWLEDGMENTS

The preparation of even preliminary plans of a project such as the one under study requires the complete cooperation of several organizations.

We are indebted to the Bureau of Engineering of the Department of Public Works of the City and County of San Francisco for its promptness in furnishing information and for its assistance in coordinating the efforts of all interested agencies, both within and outside the City government;

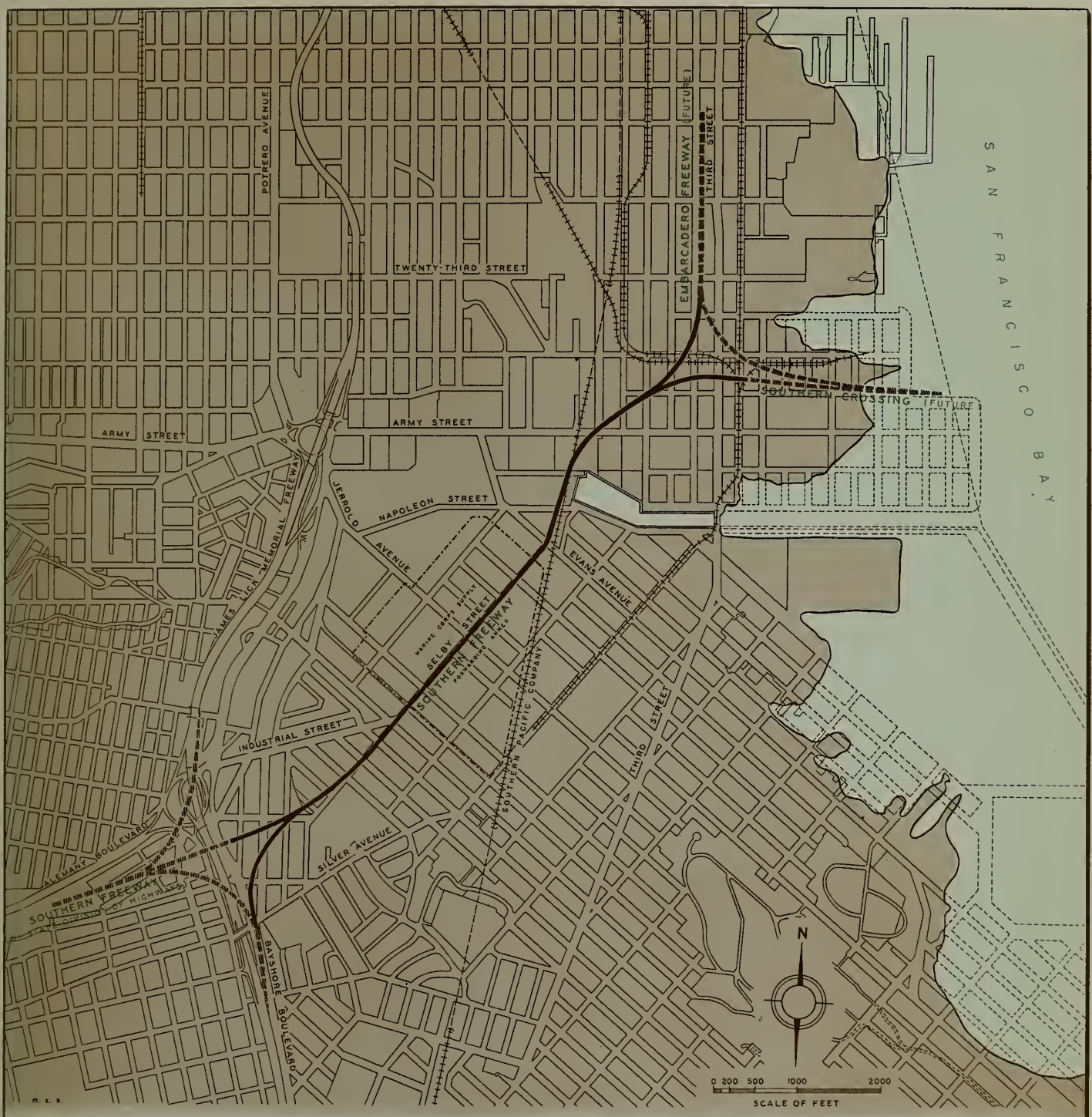
To District IV, Division of Highways, Department of Public Works, State of California, for its able assistance in preparing traffic estimates and for its cooperation in the establishment of alignments common to this project and facilities under its jurisdiction;

To the Division of San Francisco Bay Toll Crossings, Department of Public Works, State of California, for its assistance in establishing the alignment of the northeasterly connections of the project;

To the United States Marine Corps for its cooperation in furnishing information on facilities within the Marine Corps Supply Forwarding Annex;

To the Southern Pacific Company, the Pacific Gas and Electric Company, and The Pacific Telephone and Telegraph Company for their valuable assistance in furnishing complete information concerning their existing facilities and requirements.

To all of the above-named organizations and their personnel we express our sincerest appreciation and thanks for the cooperation, without which the execution of this assignment would not have been possible.



LOCATION PLAN OF PORTION OF SOUTHERN FREEWAY

EAST OF JAMES LICK MEMORIAL FREEWAY

LEGEND

SOUTHERN FREEWAY

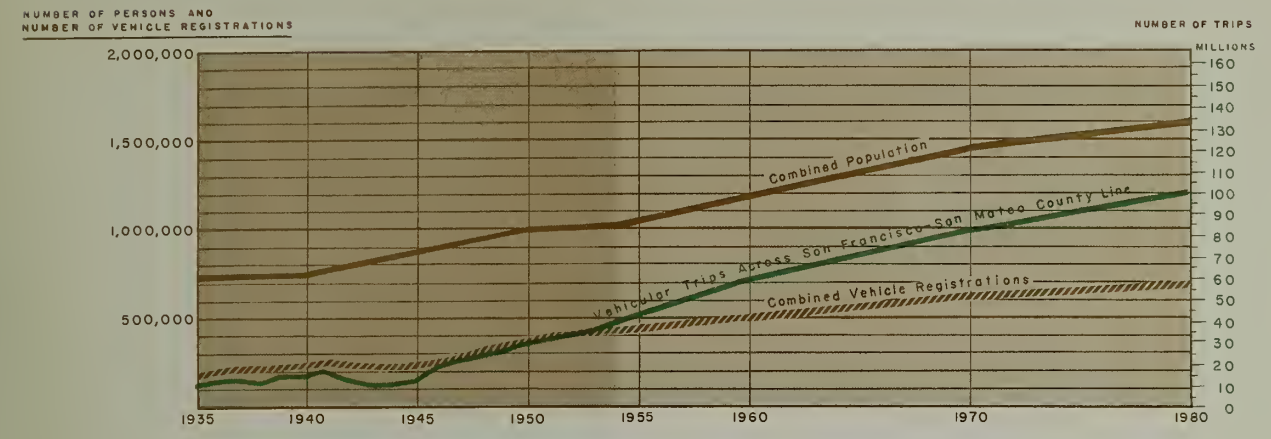
FREEWAYS AND CONNECTIONS BY OTHERS

DE LEUW, CATHER & COMPANY · ENGINEERS · SAN FRANCISCO · JULY 1956

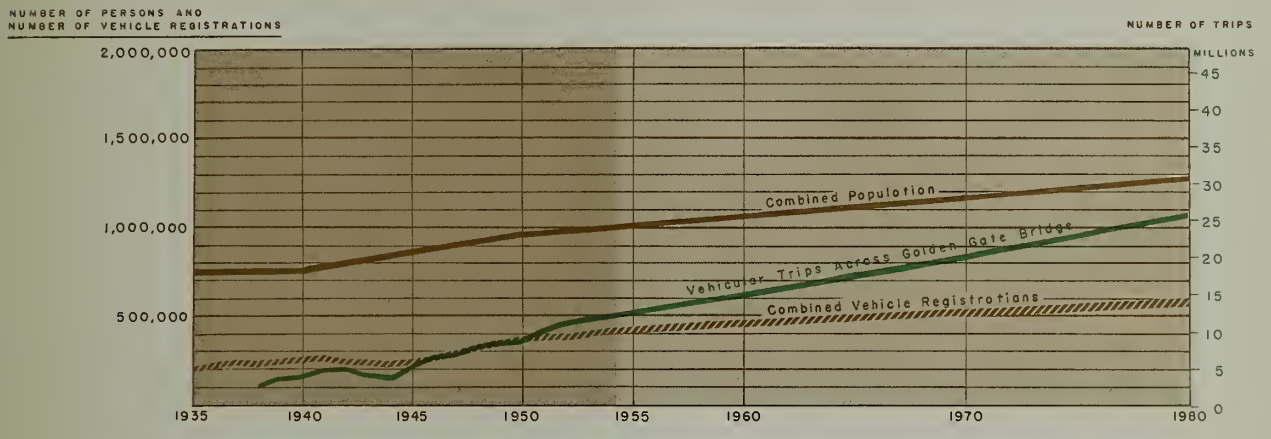
LOCATION PLAN OF ALTERNATE ROUTES STUDIED

GROWTH IN POPULATION, TRAFFIC, AND VEHICLE REGISTRATION

SAN FRANCISCO AND SAN MATEO COUNTIES



SAN FRANCISCO, MARIN, AND SONOMA COUNTIES



SAN FRANCISCO, ALAMEDA, AND CONTRA COSTA COUNTIES

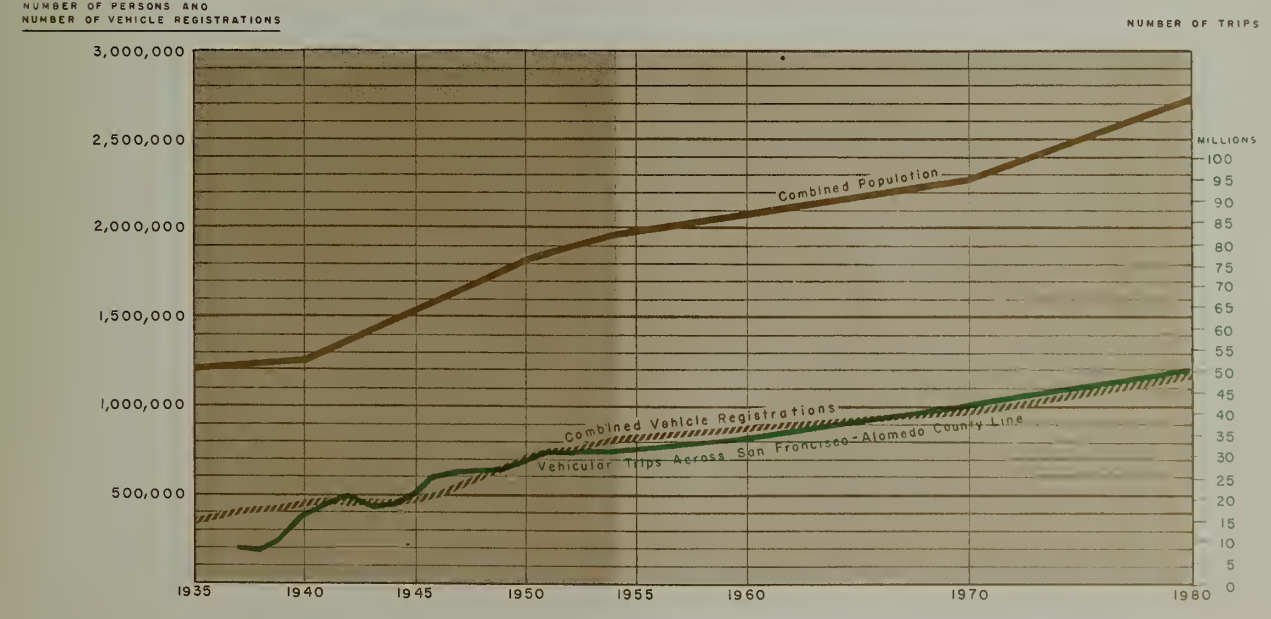
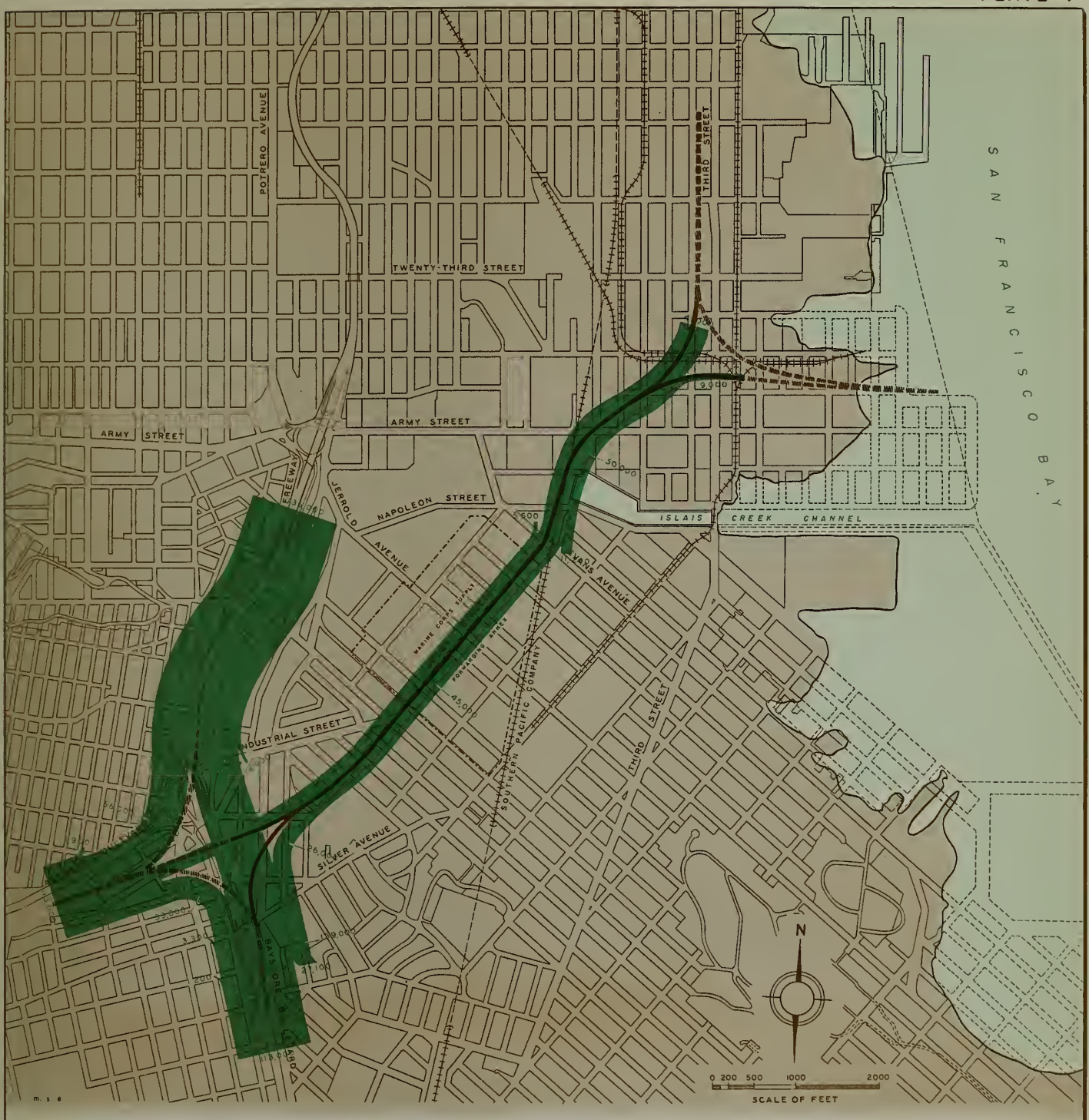


PLATE IV

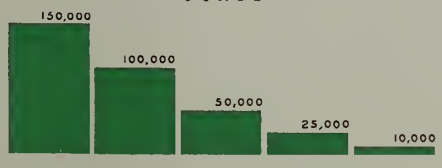
1980 SAN FRANCISCO FREEWAY NETWORK ASSUMED IN THIS STUDY



ESTIMATED 1980 AVERAGE DAILY DEMAND

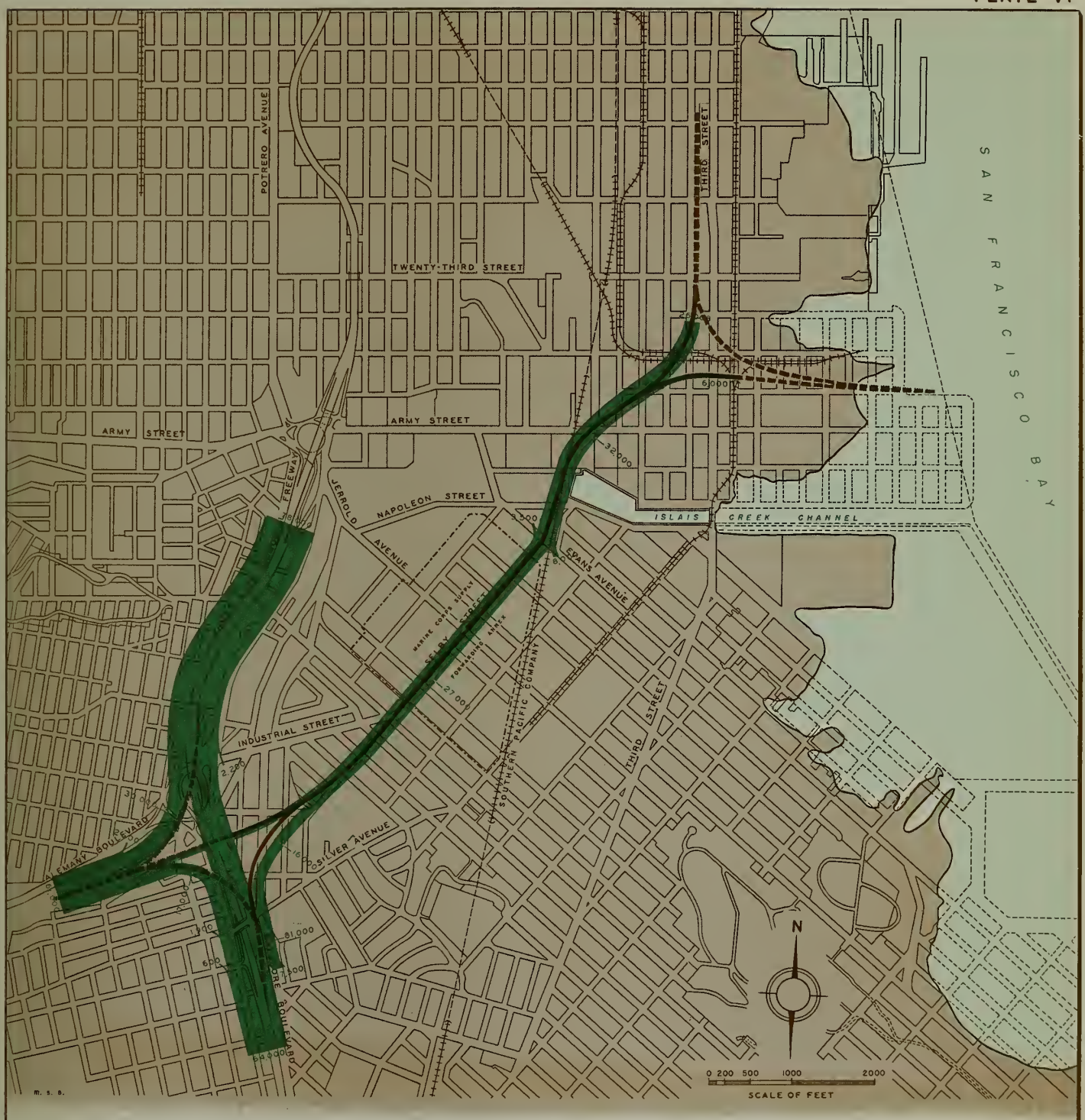
ON SOUTHERN FREEWAY AND CONNECTIONS

SCALE



NUMBER OF VEHICLES

DE LEUW, CATHER & COMPANY · ENGINEERS · SAN FRANCISCO JULY 1956

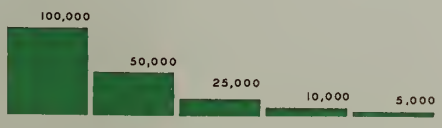


ESTIMATED 1954 AVERAGE DAILY DEMAND

ON SOUTHERN FREEWAY AND CONNECTIONS

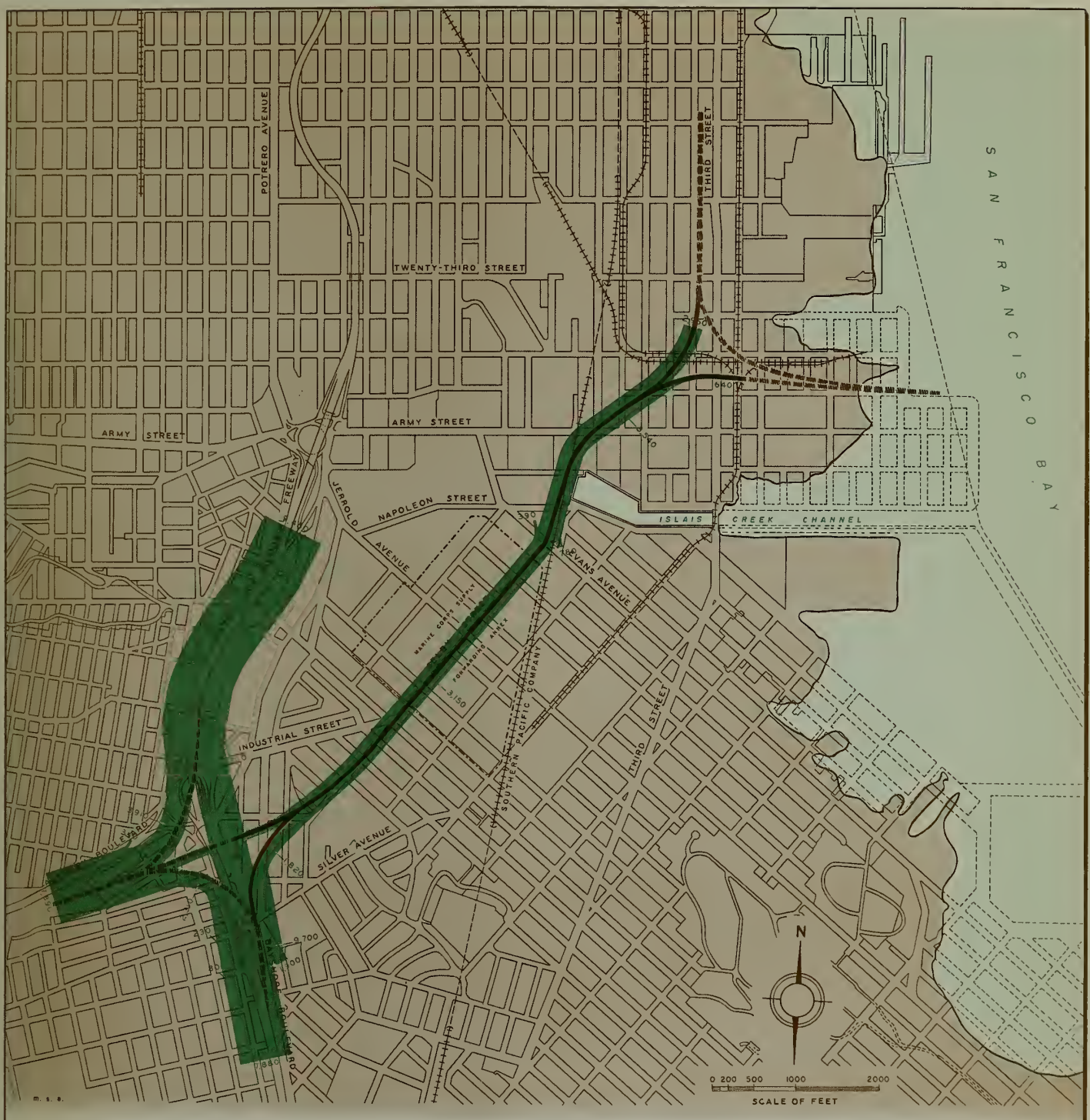
ASSUMING COMPLETE 1980 FREEWAY NETWORK IN OPERATION

SCALE



NUMBER OF VEHICLES

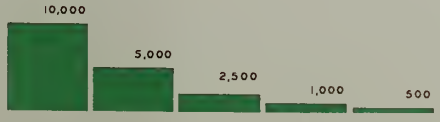
DE LEUW, CATHER & COMPANY · ENGINEERS · SAN FRANCISCO · JULY 1956



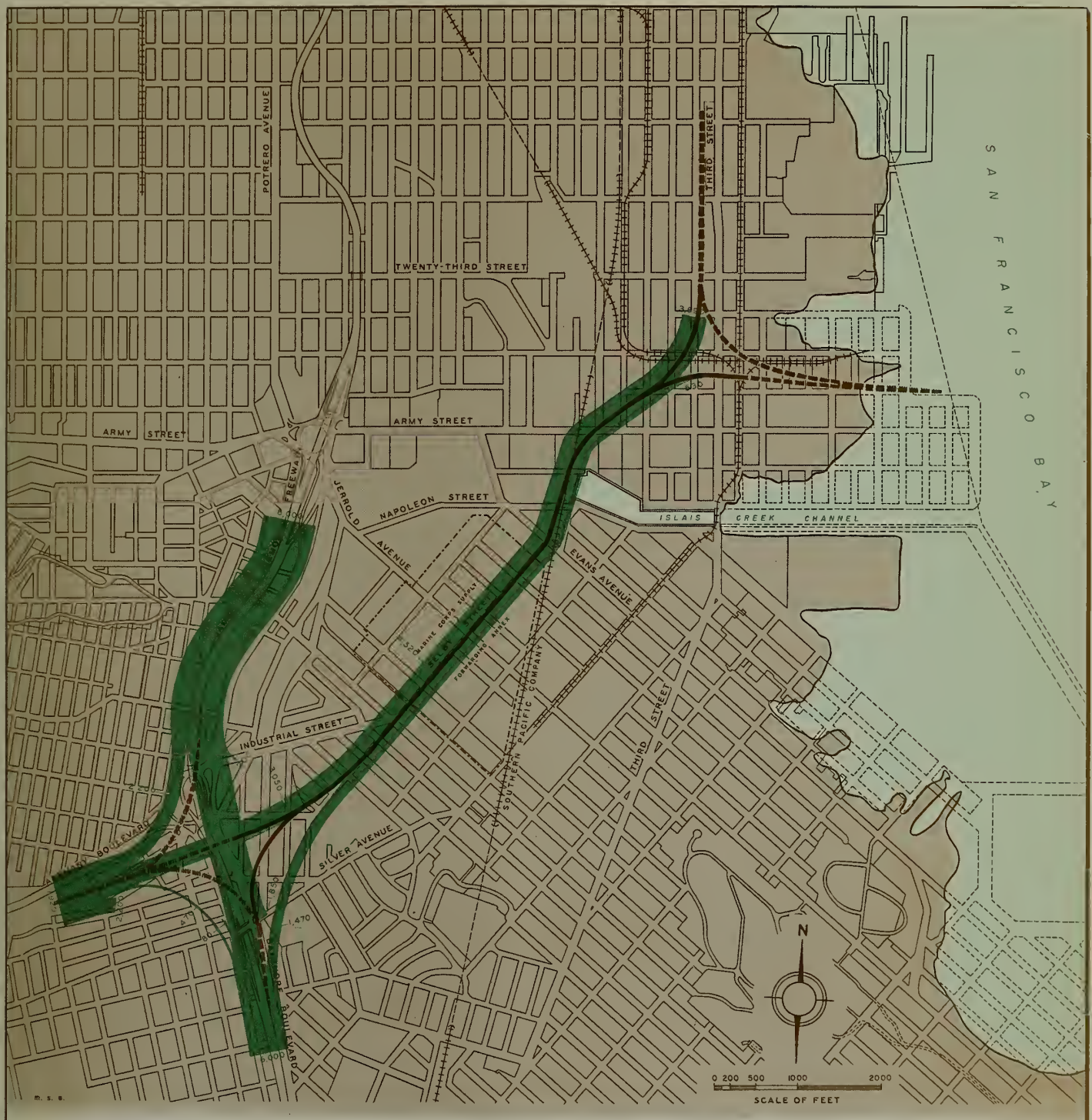
ESTIMATED 1980 ONE-WAY PEAK HOUR DEMAND

SOUTHERN FREEWAY AND CONNECTIONS

SCALE



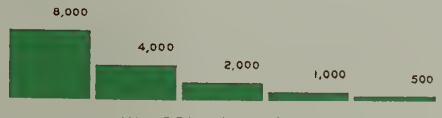
NUMBER OF VEHICLES



ESTIMATED 1980 ADJUSTED ONE-WAY PEAK HOUR VEHICULAR VOLUMES

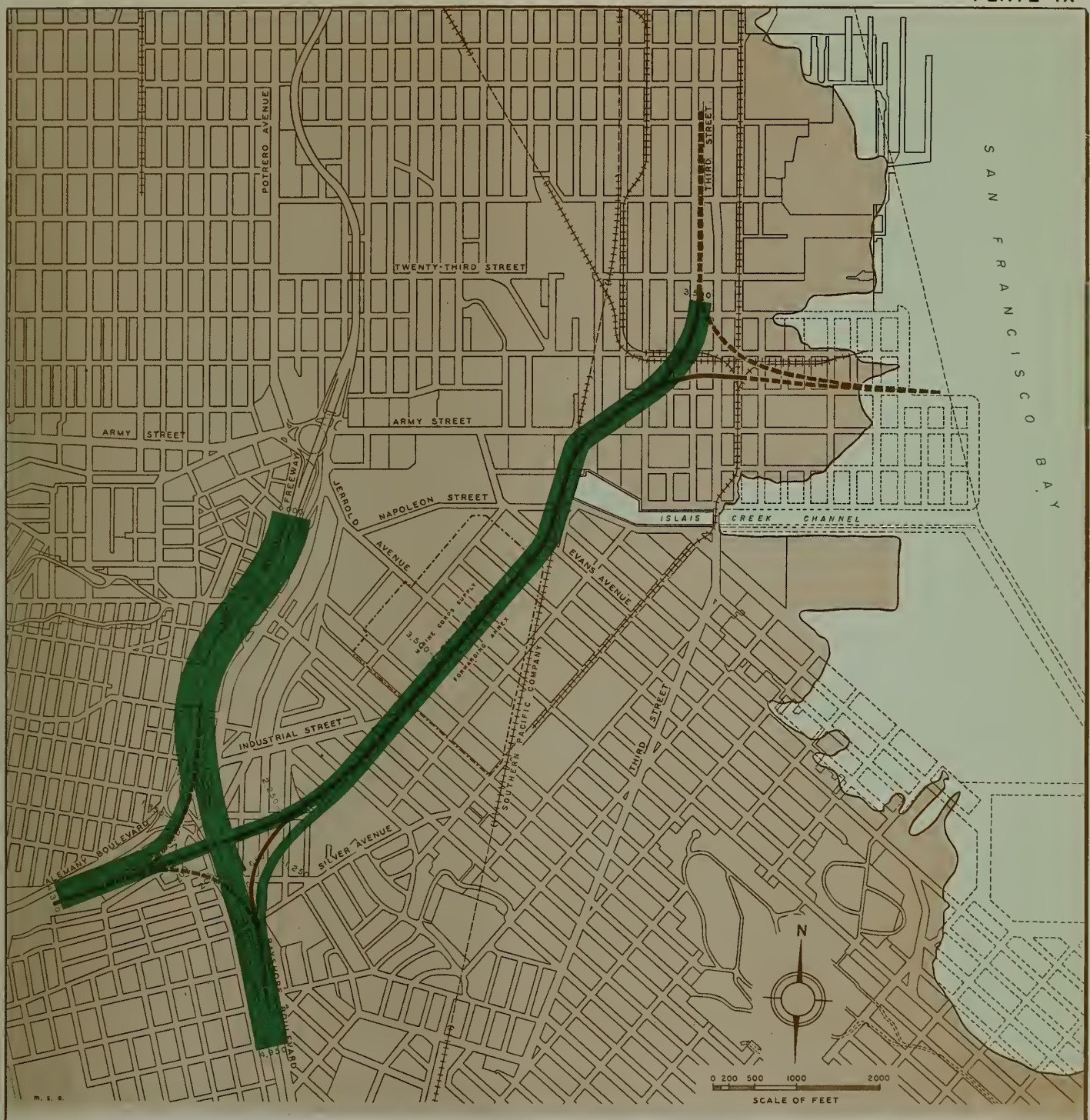
SOUTHERN FREEWAY AND CONNECTIONS

SCALE



NUMBER OF VEHICLES

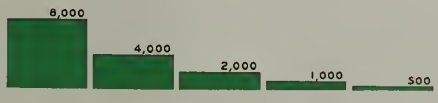
DE LEUW, CATHER & COMPANY · ENGINEERS · SAN FRANCISCO · JULY 1956



ESTIMATED 1960 ONE-WAY PEAK HOUR VEHICULAR VOLUMES

SOUTHERN FREEWAY AND CONNECTIONS

SCALE



NUMBER OF VEHICLES

APPENDIX

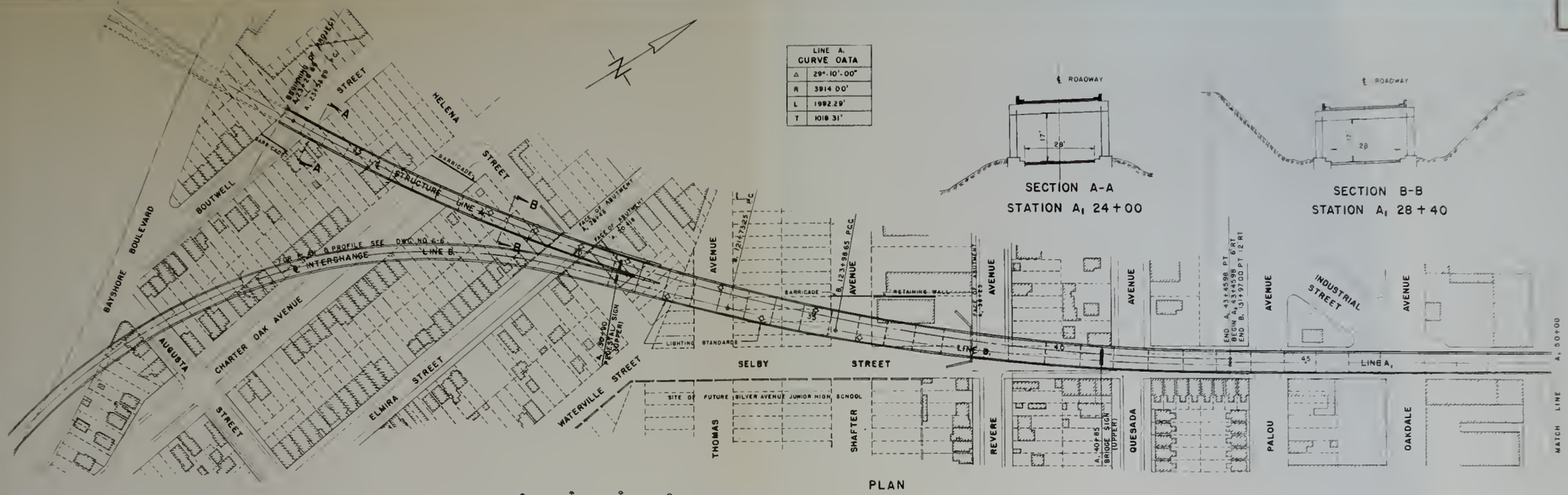
A P P E N D I X

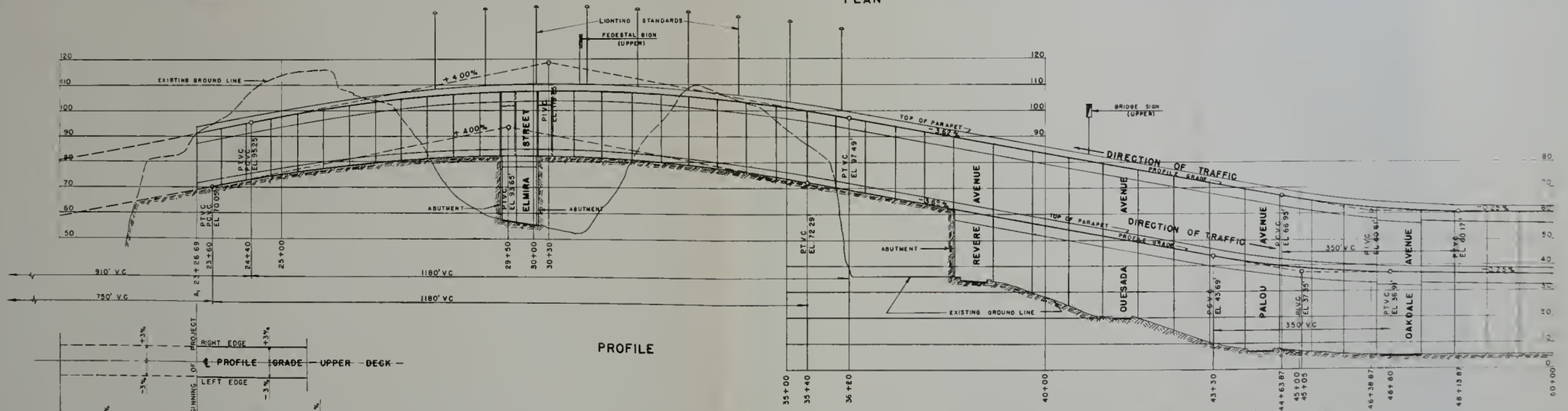
LIST OF PLANS

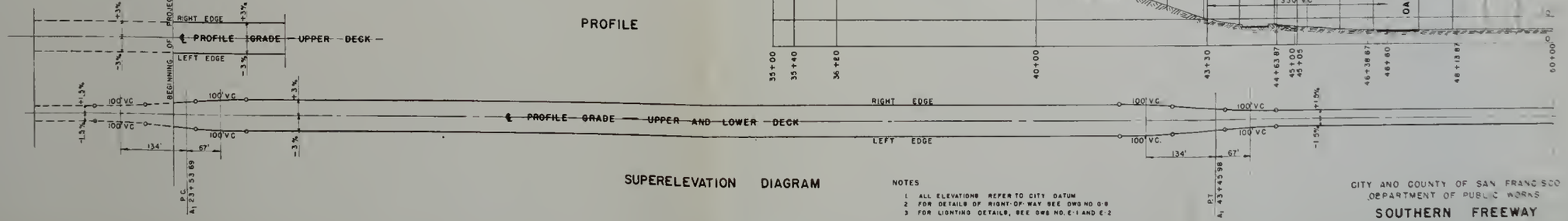
Drawing No.	
G-3	Plan and Profile - Boutwell Street to Newcomb Avenue
G-4	Plan and Profile - Newcomb Avenue to Napoleon Street
G-5	Plan and Profile - Napoleon Street to 23d Street
G-6	Plan and Profile - James Lick Memorial Freeway Interchange
G-7	Plan and Profile - Southern Crossing Interchange
G-8	Rights-of-Way - James Lick Memorial Freeway to Oakdale Avenue
G-9	Rights-of-Way - Oakdale Avenue to Evans Avenue
G-10	Rights-of-Way - Evans Avenue to End of Project
G-11	Roadway Drainage and Modifications to Sewer Lines - James Lick Memorial Freeway to Oakdale Avenue
G-12	Modifications to Sewer Lines - Oakdale Avenue to Evans Avenue
G-13	Modifications to Sewer Lines - Evans Avenue to End of Project
G-14	Typical Drainage Structures
G-15	Modifications to Water Distribution Lines - James Lick Memorial Freeway to Oakdale Avenue
G-16	Modifications to Water Distribution Lines - Oakdale Avenue to Evans Avenue
G-17	Modifications to Water Distribution Lines - Evans Avenue to End of Project
G-18	Modifications to Gas Distribution Lines - James Lick Memorial Freeway to Oakdale Avenue
G-19	Modifications to Gas Distribution Lines - Oakdale Avenue to Evans Avenue

APPENDIX - CONTINUED

Drawing No.	Title
G-20	Modifications to Gas Distribution Lines - Evans Avenue to End of Project
G-21	Modifications to Electrical Distribution and Telephone Lines - James Lick Memorial Freeway to Oakdale Avenue
G-22	Modifications to Electrical Distribution and Telephone Lines - Oakdale Avenue to Evans Avenue
G-23	Modifications to Electrical Distribution and Telephone Lines - Evans Avenue to End of Project
G-24	Fence Details
G-25	Soils Profile and Logs of Test Borings
G-26	Typical Roadway Sections and Pavement Details
S-1	Three-lane, Two-level Viaduct - Typical Section and Elevation - Portion Outside U.S.M.C. Supply Forwarding Annex
S-2	Three-lane, Two-level Viaduct - Typical Section and Elevation - Portion Through U.S.M.C. Supply Forwarding Annex
S-3	Two-lane Viaducts - Typical Sections and Elevations
S-4	Crossing of Southern Pacific Main Tracks - Plan, Elevation, and Section
S-5	Abutments - Plan, Elevation and Sections
S-6	Superstructure Details
S-7	Miscellaneous Details
S-8	Retaining Wall, Approach Slab, and Pavement Details
E-1	Freeway Lighting - Location Plan and Elevations - Vicinity of Revere Avenue
E-2	Freeway Lighting - Location Plan and Elevations - Vicinity of 26th Avenue
E-3	Freeway Lighting - Fixture Mounting Details







SCALE

HORIZONTAL 1" = 100'

VERTICAL 1" = 20'

NOTES

1. ALL ELEVATIONS REFER TO CITY DATUM
2. FOR DETAILS OF RIGHT-OF-WAY SEE DWG NO. G-8
3. FOR LIGHTING DETAILS, SEE DWG NO. E-1 AND E-2

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

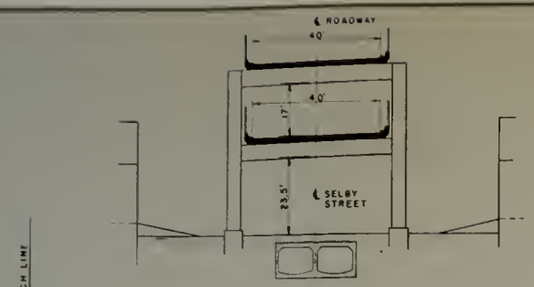
SOUTHERN FREEWAY

PLAN AND PROFILE
BOUTWELL STREET TO NEWCOMB AVENUE

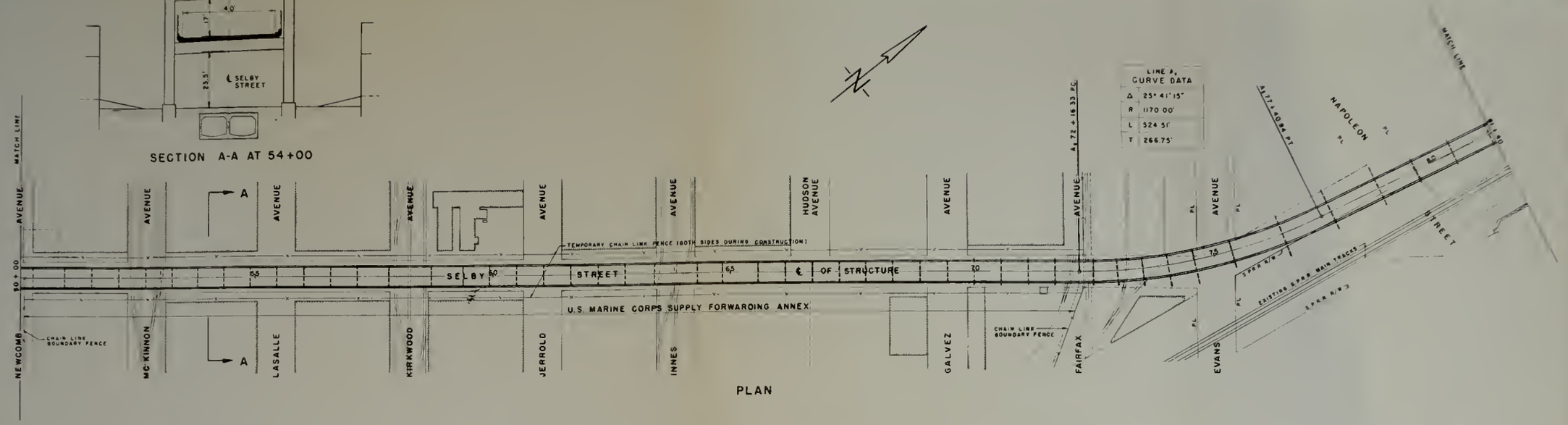
DECEMBER 1955 DWG NO. G-3

DE LEUW, CATHER & COMPANY · CONSULTING ENGINEERS · SAN FRANCISCO

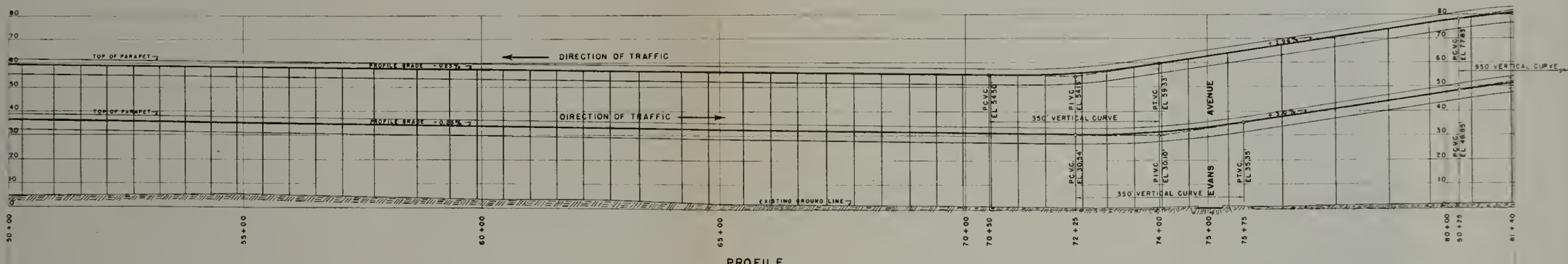
NOTE: THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



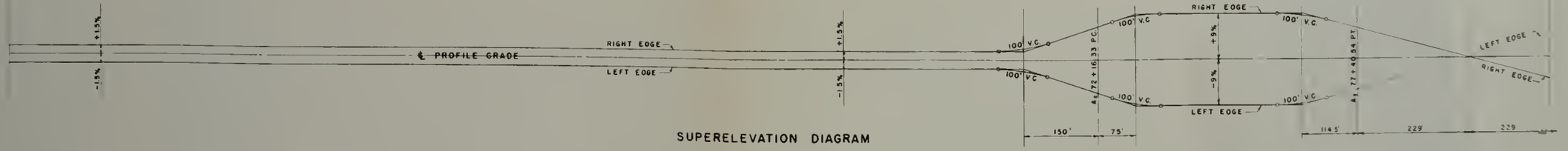
SECTION A-A AT 54+00



PLAN



PROFILE



SUPERELEVATION DIAGRAM

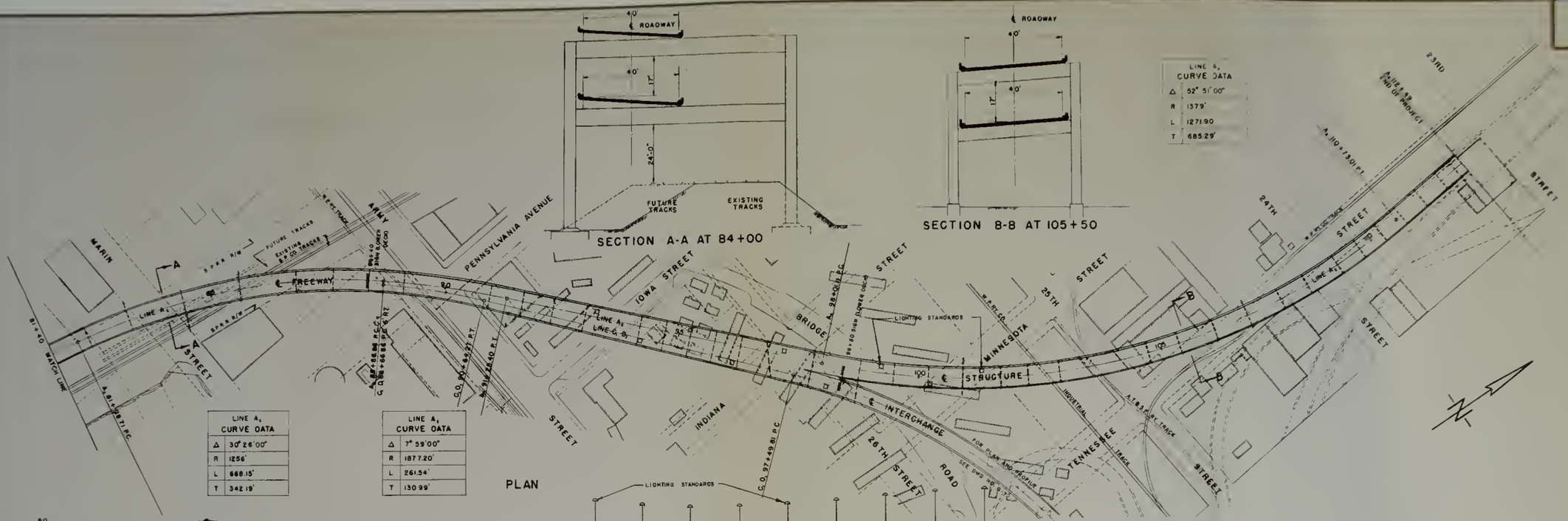
NOTES:

1 ALL ELEVATIONS REFER TO CITY DATUM.
2 FOR DETAILS OF RIGHT-OF-WAY SEE DWG G-9

SCALE
HORIZONTAL 1" = 100' 0 100 200 300
VERTICAL 1" = 20' 0 20 40 60

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
SOUTHERN FREEWAY
PLAN AND PROFILE
NEWCOMB AVENUE TO NAPOLEON STREET
DECEMBER 1955 DWG. NO. G-4
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN.



NOTES:
1. ALL ELEVATIONS REFER TO CITY DATUM
2. FOR DETAILS OF RIGHT-OF-WAY SEE DWG NO. G-10
3. FOR LIGHTING DETAILS SEE DWG NO. E-2 AND E-3

SCALES
HORIZONTAL 1" = 100'
VERTICAL 1" = 20'

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

PLAN AND PROFILE
NAPOLEON STREET TO 23RD STREET

DECEMBER 1955 DWG NO G-5

DE LEUW, CATHER & COMPANY · CONSULTING ENGINEERS SAN FRANCISCO

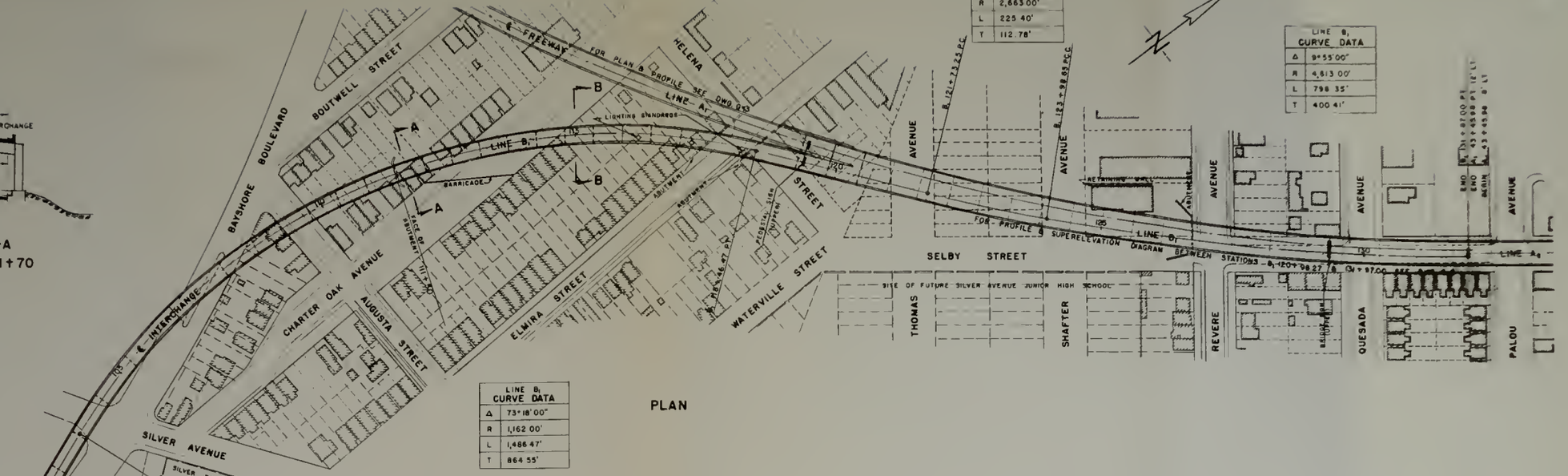
NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

SECTION A-A
STATION B, 111+70

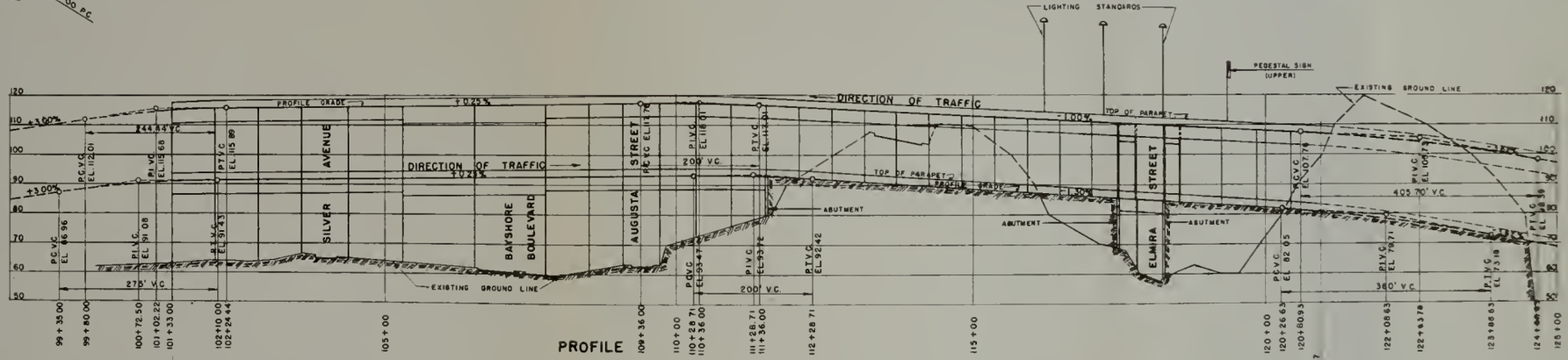
LINE B, CURVE DATA	
Δ	4°51'00"
R	2,663.00'
L	225.40'
T	112.78'

LINE B, CURVE DATA	
Δ	9°55'00"
R	4,613.00'
L	798.35'
T	400.41'

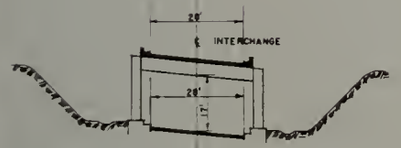
LINE B, CURVE DATA	
Δ	73°18'00"
R	1,162.00'
L	1,486.47'
T	864.55'



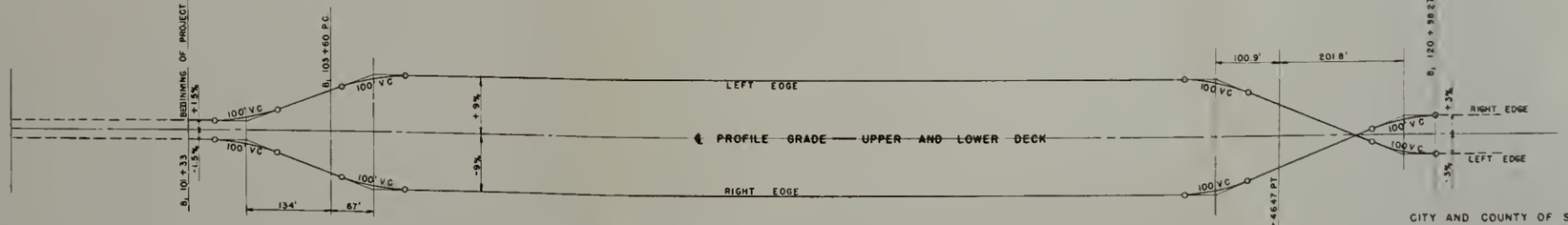
PLAN



PROFILE



SECTION B-B
STATION B, 115+00



SUPERELEVATION DIAGRAM

SCALE
HORIZONTAL 1"=100'
VERTICAL 1"=20'

NOTES
1. ALL ELEVATIONS TO CITY DATUM
2. FOR DETAILS OF RIGHT-OF-WAY SEE DWG NO. 6-6
3. FOR LIGHTING DETAILS SEE DWGS NO E-1 AND E-5

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

PLAN AND PROFILE
JAMES LICK FREEWAY INTERCHANGE

DECEMBER 1955 DWG NO. 6-6

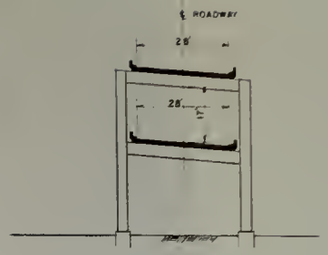
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE: THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

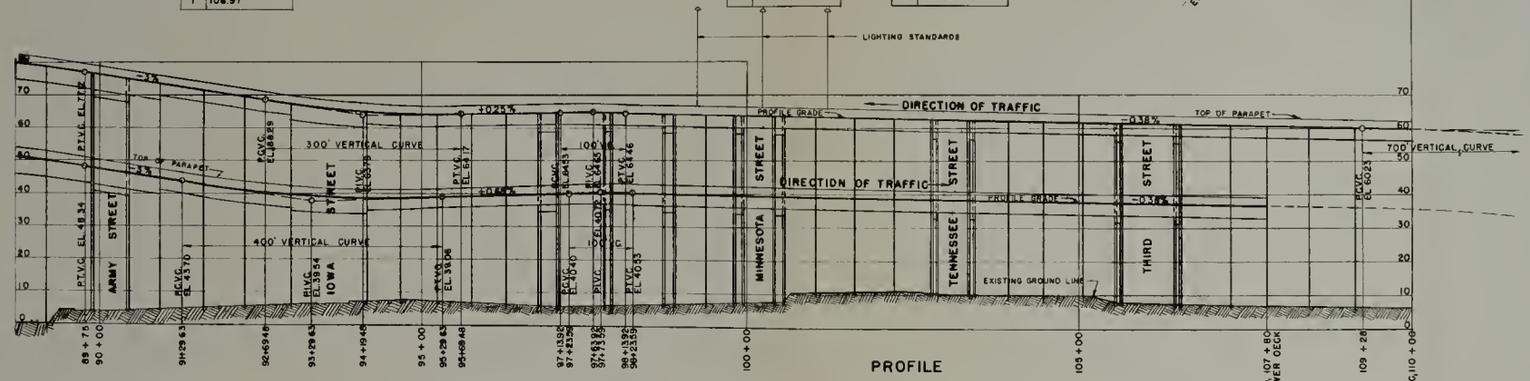
LINE G.O. CURVE DATA	
Δ	9°57'00"
R	1252'
L	217.41'
T	108.97'

LINE C, CURVE DATA	
Δ	40°25'00"
R	1164'
L	821.03'
T	428.46'

LINE D, CURVE DATA	
Δ	46°31'00"
R	1164'
L	944.95'
T	500.29'

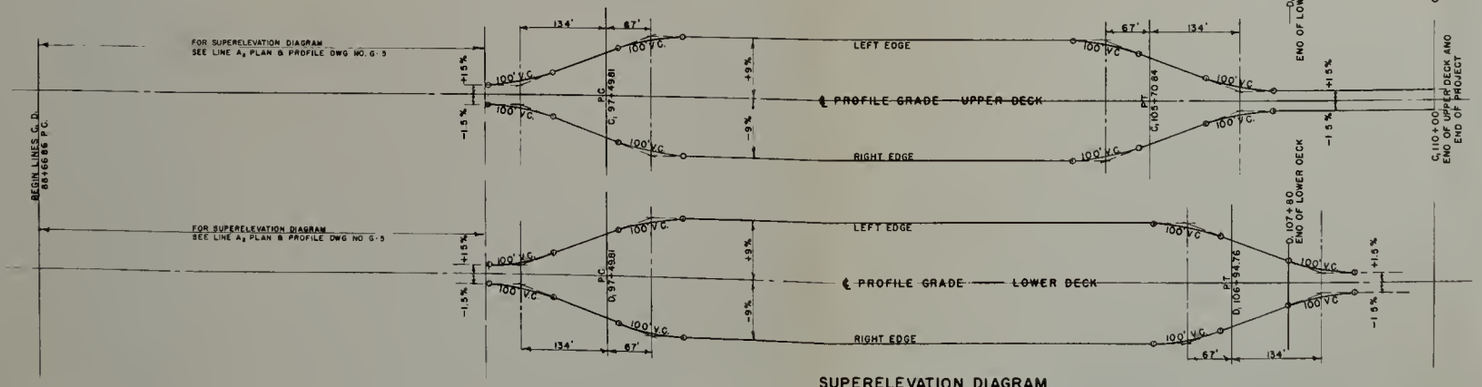


SECTION A-A AT 104 + 00



NOTES.

1. ALL ELEVATIONS REFER TO CITY DATUM
2. FOR DETAILS OF RIGHT-OF-WAY SEE DWG NO G-10
3. FOR LIGHTING DETAILS SEE DWGS NO E-2 AND E-3


FOR SUPERELEVATION DIAGRAM SEE LINE A, PLAN & PROFILE DWG NO. G-5
LEFT EDGE
℄ PROFILE GRADE — UPPER DECK
RIGHT EDGE
℄ PROFILE GRADE — LOWER DECK
END OF UPPER DECK AND END OF PROJECT
END OF LOWER DECK
BEGIN LINE C, D.
SUPERELEVATION DIAGRAM

SCALE

HORIZONTAL 1" = 100'

VERTICAL 1" = 20'

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

PLAN AND PROFILE
SOUTHERN CROSSING INTERCHANGE

DECEMBER 1955 DWG NO. G-7

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS SAN FRANCISCO

NOTE: THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

SCALE 1" = 100'

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

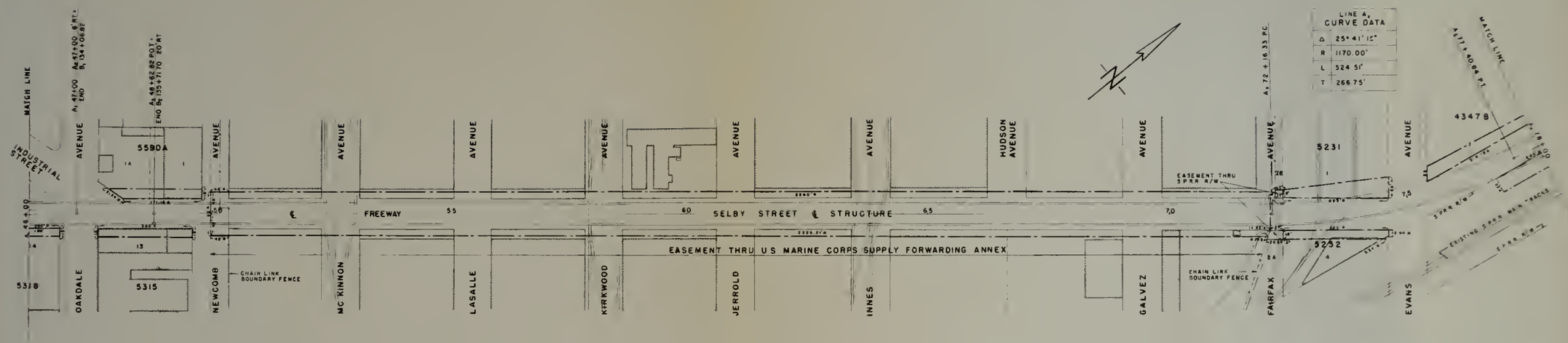
SOUTHERN FREEWAY

RIGHTS - OF - WAY
JAMES LICK FREEWAY TO OAKDALE AVENUE

DECEMBER 1955 DWG NO G-8

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



SCALE 1" = 100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

RIGHTS-OF-WAY
OAKDALE AVENUE TO EVANS AVENUE

DECEMBER 1955 DWG. NO. G-9

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

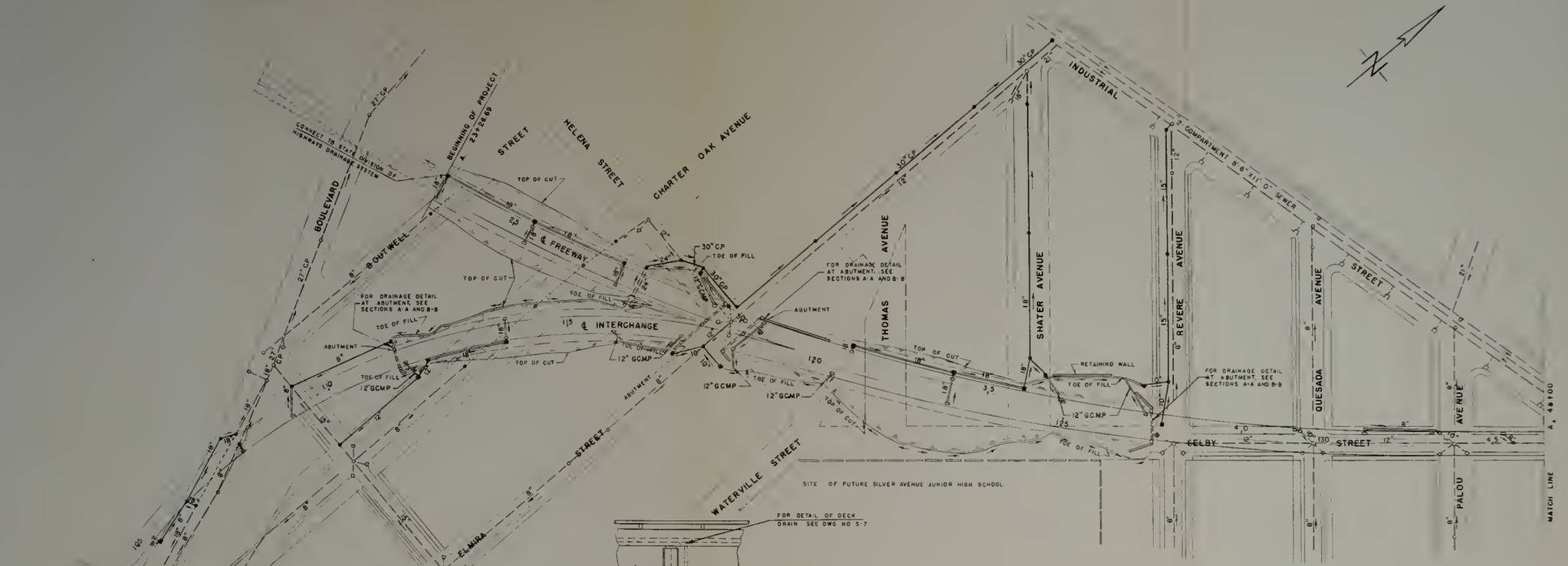
RIGHTS-OF-WAY
EVANS AVENUE TO END OF PROJECT

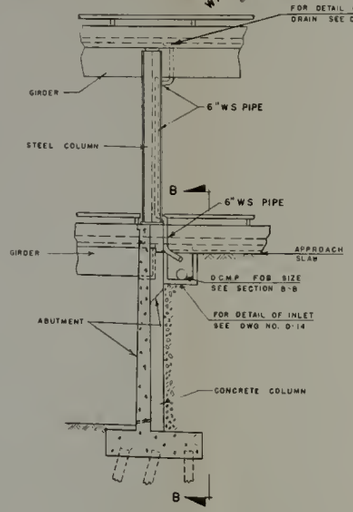
DECEMBER 1955 DWG NO. 6-10

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

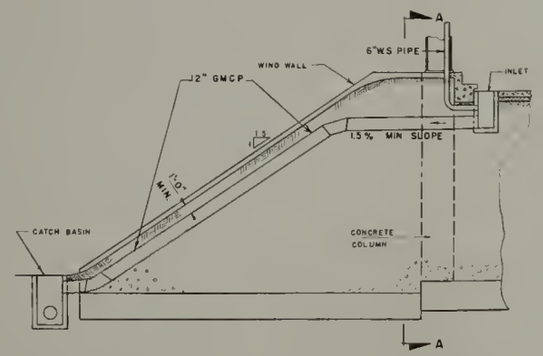
NOTES

1 ALL PIPES IN ROADWAY AT GRADE SHALL BE REINFORCED CONCRETE PIPES, UNLESS OTHERWISE NOTED
2 ALL NEW SEWERS SHALL BE VITRIFIED CLAY PIPES, UNLESS OTHERWISE NOTED
3 FOR DECK DRAINAGE DETAIL, SEE DWGS NO S-6 AND S-7
4 FOR DETAILS OF INLET, CATCH BASIN AND MANHOLE, SEE DWG NO D-14
5 FOR DETAILS OF ROADWAY DRAINAGE, SEE DWG. NO D-28
6 VCP SEWERS LARGER THAN 21" SHALL BE ON REINFORCED CONCRETE FOUNDATION





SECTION A-A



SECTION B-B

SCALES 1" = 8' 0 5 10 20
1" = 100' 0 100 200 300

DRAINAGE DETAIL AT ABUTMENTS

SCALE 1" = 8'-0"

LEGEND

- NEW SEWER
- NEW SEWER FOR DECK DRAINAGE
- EXISTING SEWER TO BE RETAINED
- EXISTING SEWER TO BE ABANDONED
- NEW CULVERT
- NEW OPEN DITCH
- NEW MANHOLE
- EXISTING MANHOLE TO BE RETAINED
- EXISTING MANHOLE TO BE ABANDONED
- NEW CATCH BASIN
- EXISTING CATCH BASIN TO BE RETAINED
- EXISTING CATCH BASIN TO BE ABANDONED
- G.C.M.P GALVANIZED CORRUGATED METAL PIPE
- NEW INLET IN ROADWAY AT GRADE OR DECK DRAIN
- C.P CONCRETE PIPE
- W.S.P WELDED STEEL PIPE

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

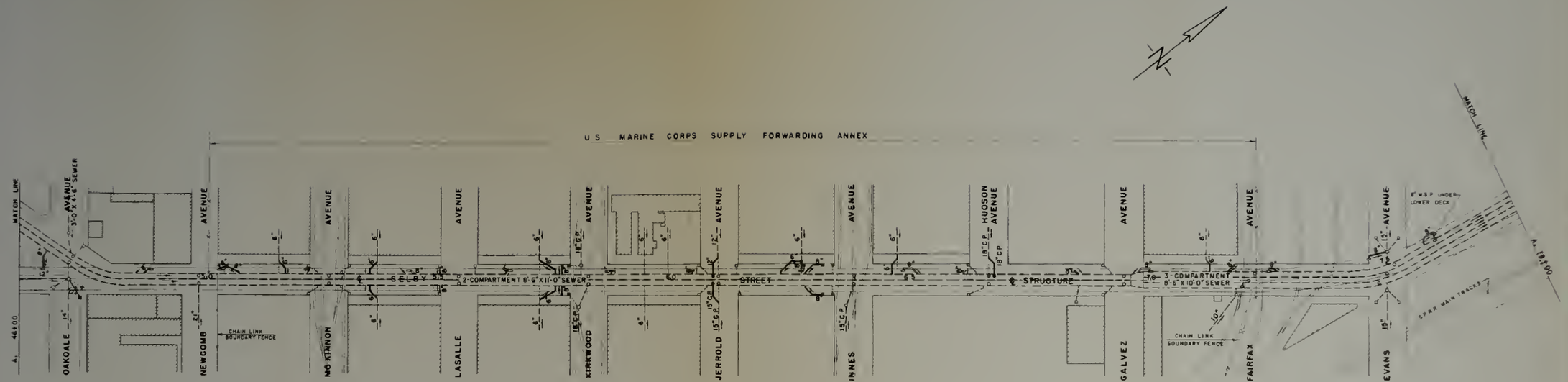
SOUTHERN FREEWAY

ROADWAY DRAINAGE AND MODIFICATIONS TO SEWER LINES
JAMES LICK FREEWAY TO OAKDALE AVENUE

DECEMBER 1955 DWG NO G-1

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



LEGEND

- NEW SEWER
- NEW SEWER FOR DECK DRAINAGE
- EXISTING SEWER TO BE RETAINED
- EXISTING SEWER TO BE ABANDONED
- NEW MANHOLE
- EXISTING MANHOLE TO BE RETAINED
- EXISTING MANHOLE TO BE ABANDONED
- NEW CATCH BASIN
- EXISTING CATCH BASIN TO BE RETAINED
- EXISTING CATCH BASIN TO BE ABANDONED
- C.P CONCRETE PIPE
- NEW DECK DRAIN OR INLET AT GRADE
- W.S.P WELDED STEEL PIPE

SCALE 1"=100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

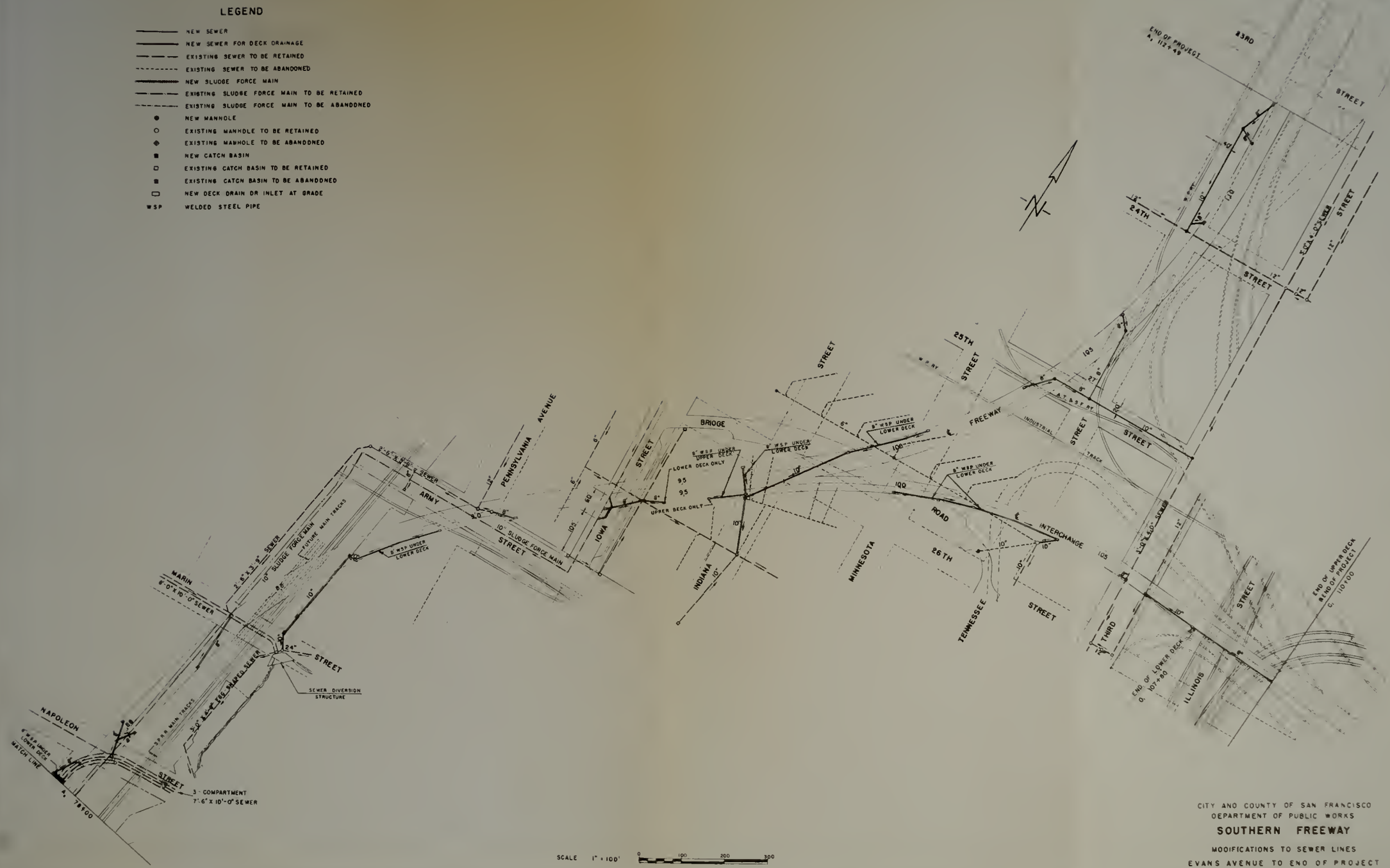
SOUTHERN FREEWAY

MODIFICATIONS TO SEWER LINES
OAKDALE AVENUE TO EVANS AVENUE

DECEMBER 1955 DWG NO. S-12

DE LEUW, CATHER & COMPANY · CONSULTING ENGINEERS · SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

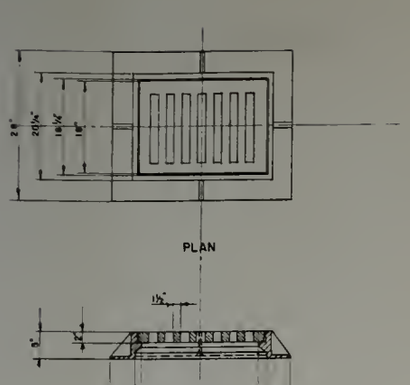
SOUTHERN FREEWAY

MODIFICATIONS TO SEWER LINES
EVANS AVENUE TO END OF PROJECT

DECEMBER 1955 DWG NO G-13

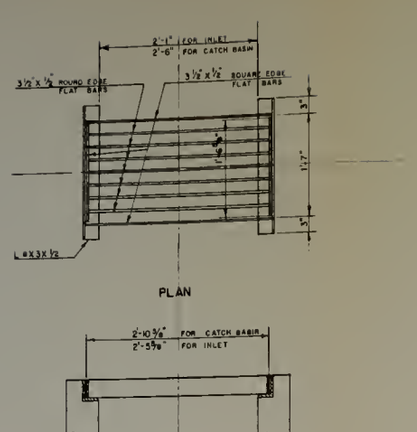
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



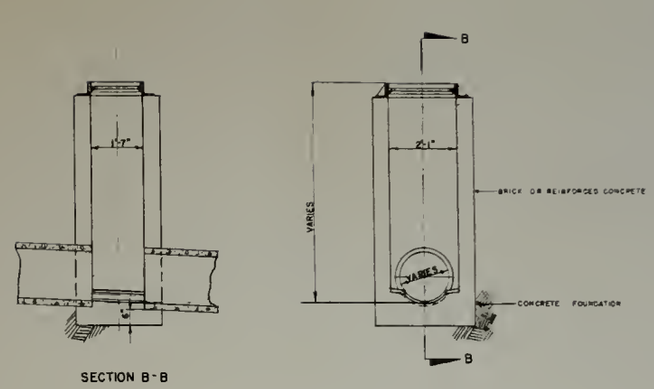
FRAME & GRATE FOR INLETS
IN ROADWAY PAVEMENT

SCALE 1"=1'-0"



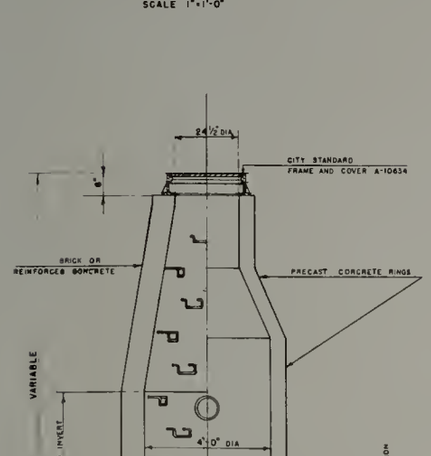
FRAME & GRATE FOR INLETS AND
CATCH BASINS IN SIDE DITCHES

SCALE 1"=1'-0"



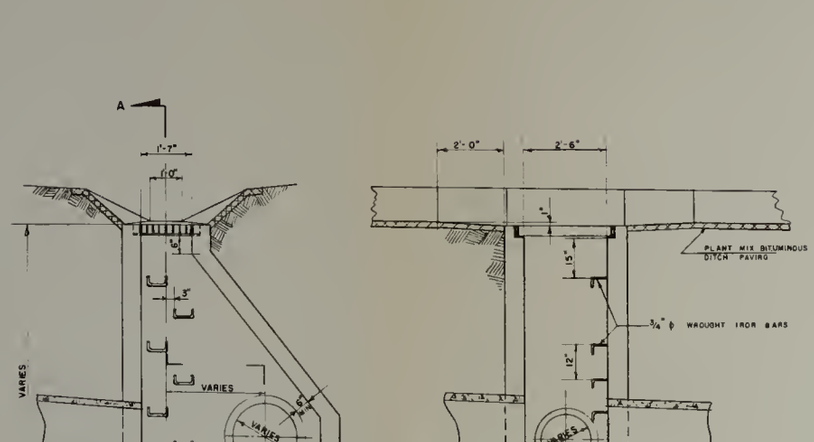
TYPICAL STORM WATER INLET

SCALE ½"=1'-0"



TYPICAL MANHOLE

SCALE ½"=1'-0"



TYPICAL CATCH BASIN IN ROADWAY DITCH

SCALE ½"=1'-0"

SCALES ½"=1'-0"

1"=1'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

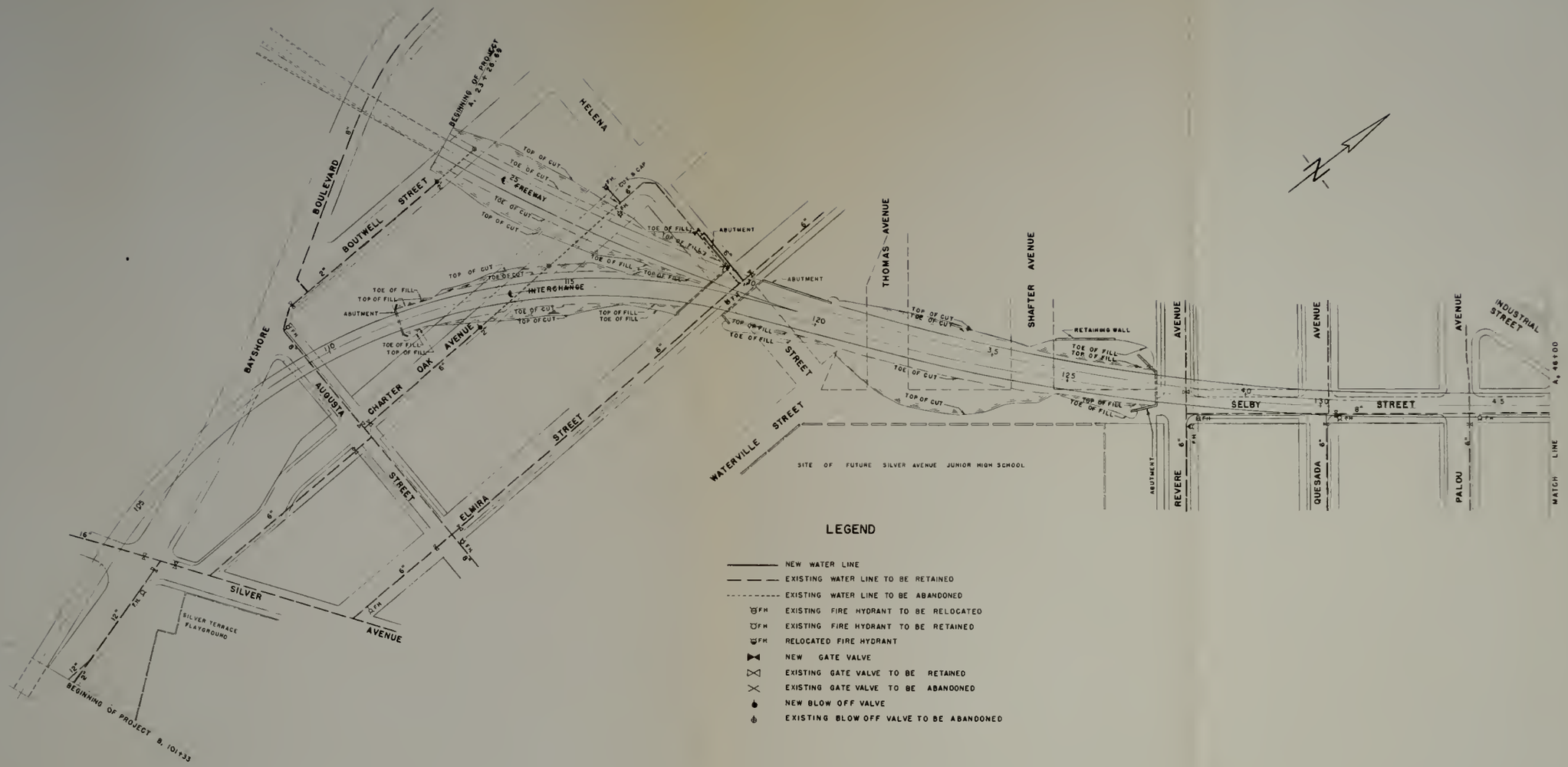
SOUTHERN FREEWAY

TYPICAL DRAINAGE STRUCTURES

DECEMBER 1955 DWG NO 6-14

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



LEGEND

- NEW WATER LINE
- EXISTING WATER LINE TO BE RETAINED
- EXISTING WATER LINE TO BE ABANDONED
- EXISTING FIRE HYDRANT TO BE RELOCATED
- EXISTING FIRE HYDRANT TO BE RETAINED
- RELOCATED FIRE HYDRANT
- NEW GATE VALVE
- EXISTING GATE VALVE TO BE RETAINED
- EXISTING GATE VALVE TO BE ABANDONED
- NEW BLOW OFF VALVE
- EXISTING BLOW OFF VALVE TO BE ABANDONED

SCALE 1"=100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO
WATER DISTRIBUTION LINES
JAMES LICK FREEWAY TO OAKDALE AVENUE

DECEMBER 1955 DWG NO G-15

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

LEGEND

- NEW WATER LINE
- EXISTING WATER LINE TO BE RETAINED
- EXISTING WATER LINE TO BE ABANDONED
- EXISTING HIGH PRESSURE WATER LINE
- FH EXISTING FIRE HYDRANT TO BE RETAINED
- NEW GATE VALVE
- EXISTING GATE VALVE TO BE RETAINED
- EXISTING GATE VALVE TO BE ABANDONED
- NEW CHECK VALVE
- EXISTING CHECK VALVE TO BE ABANDONED
- EXISTING BLOWOFF VALVE TO BE RETAINED
- NEW WATER METER
- EXISTING WATER METER TO BE ABANDONED

SCALE 1" = 100'

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO
WATER DISTRIBUTION LINES
OAKDALE AVENUE TO EVANS AVENUE

DECEMBER 1955 DWG NO G-16

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

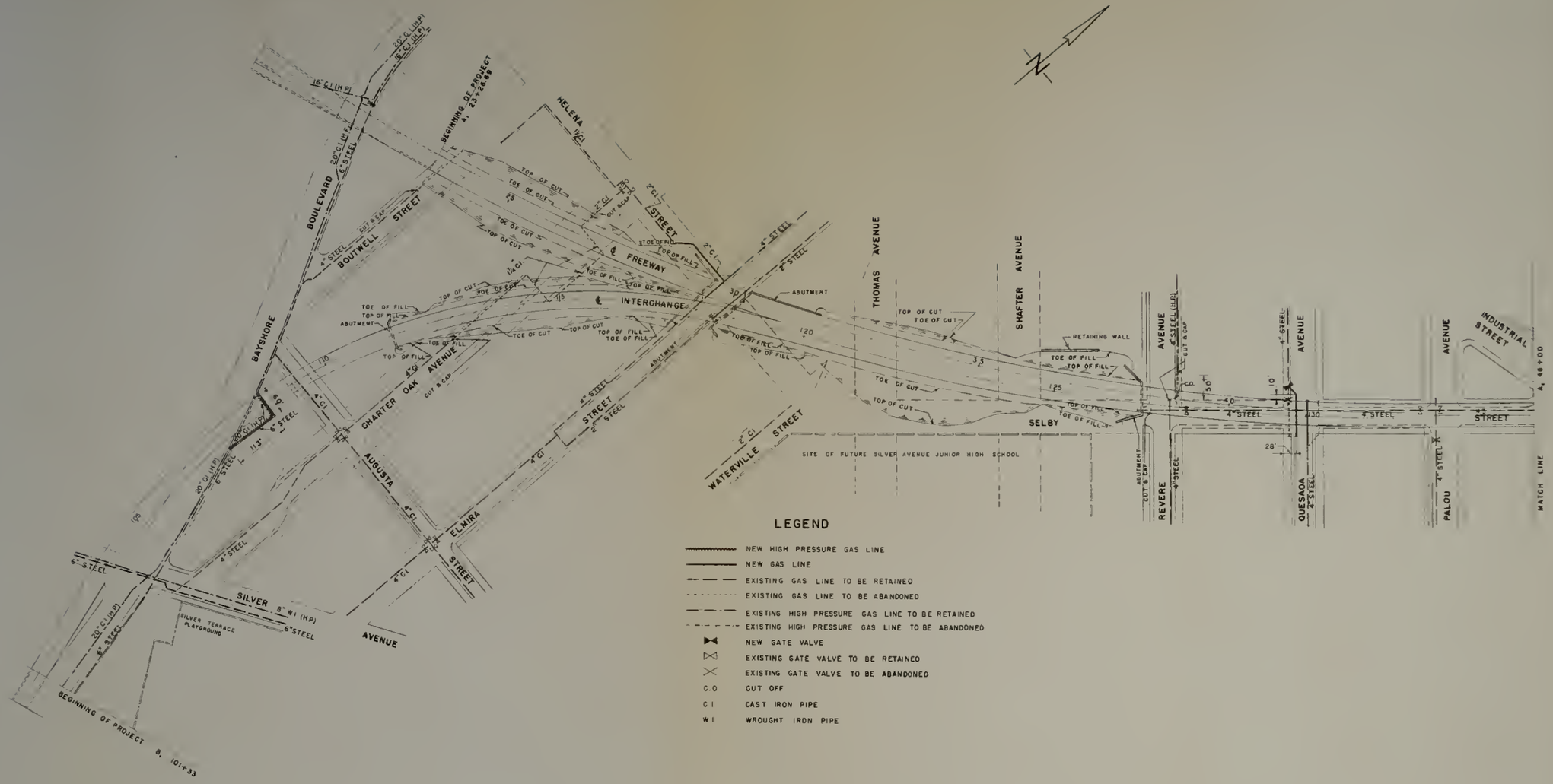
SOUTHERN FREEWAY

MODIFICATIONS TO
WATER DISTRIBUTION LINES
EVANS AVENUE TO END OF PROJECT

DECEMBER 1955 DWG NO 6-17

DE LEUW, CATHER & COMPANY – CONSULTING ENGINEERS – SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



LEGEND

- NEW HIGH PRESSURE GAS LINE
- NEW GAS LINE
- EXISTING GAS LINE TO BE RETAINED
- EXISTING GAS LINE TO BE ABANDONED
- EXISTING HIGH PRESSURE GAS LINE TO BE RETAINED
- EXISTING HIGH PRESSURE GAS LINE TO BE ABANDONED
- NEW GATE VALVE
- EXISTING GATE VALVE TO BE RETAINED
- EXISTING GATE VALVE TO BE ABANDONED
- C.O CUT OFF
- C I CAST IRON PIPE
- W I WROUGHT IRON PIPE

SCALE 1"=100' 0 100 200 300

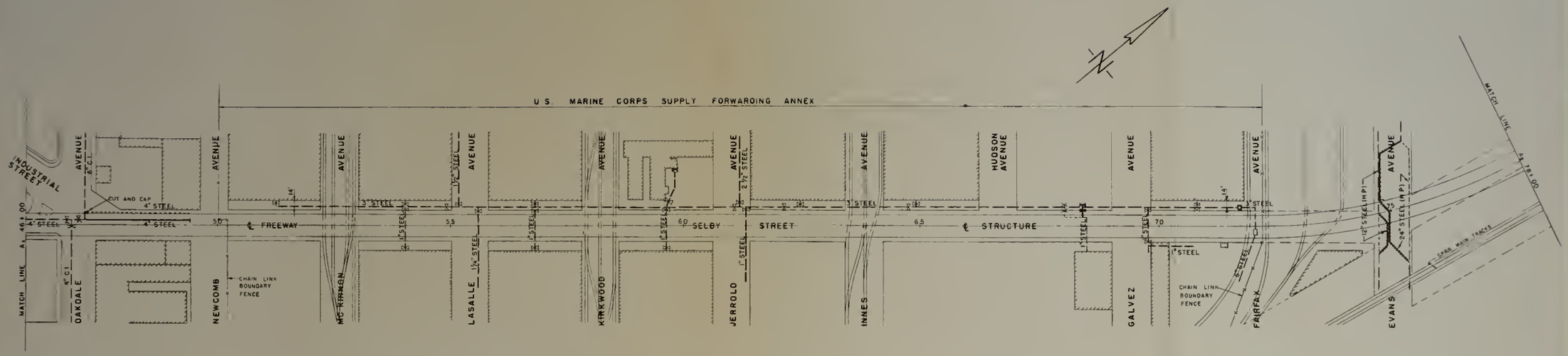
CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO
GAS DISTRIBUTION LINES
JAMES LICK FREEWAY TO OAKDALE AVENUE
DECEMBER 1955 DWG NO. G-18

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



LEGEND

- NEW GAS LINE
- EXISTING GAS LINE TO BE RETAINED
- EXISTING GAS LINE TO BE ABANDONED
- NEW HIGH PRESSURE GAS LINE
- EXISTING HIGH PRESSURE GAS LINE TO BE RETAINED
- EXISTING HIGH PRESSURE GAS LINE TO BE ABANDONED
- NEW GATE VALVE
- EXISTING GATE VALVE TO BE RETAINED
- EXISTING GATE VALVE TO BE ABANDONED
- EXISTING MANHOLE TO BE RETAINED
- EXISTING METER TO BE RETAINED
- C.I. CAST IRON PIPE

SCALE 1" = 100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

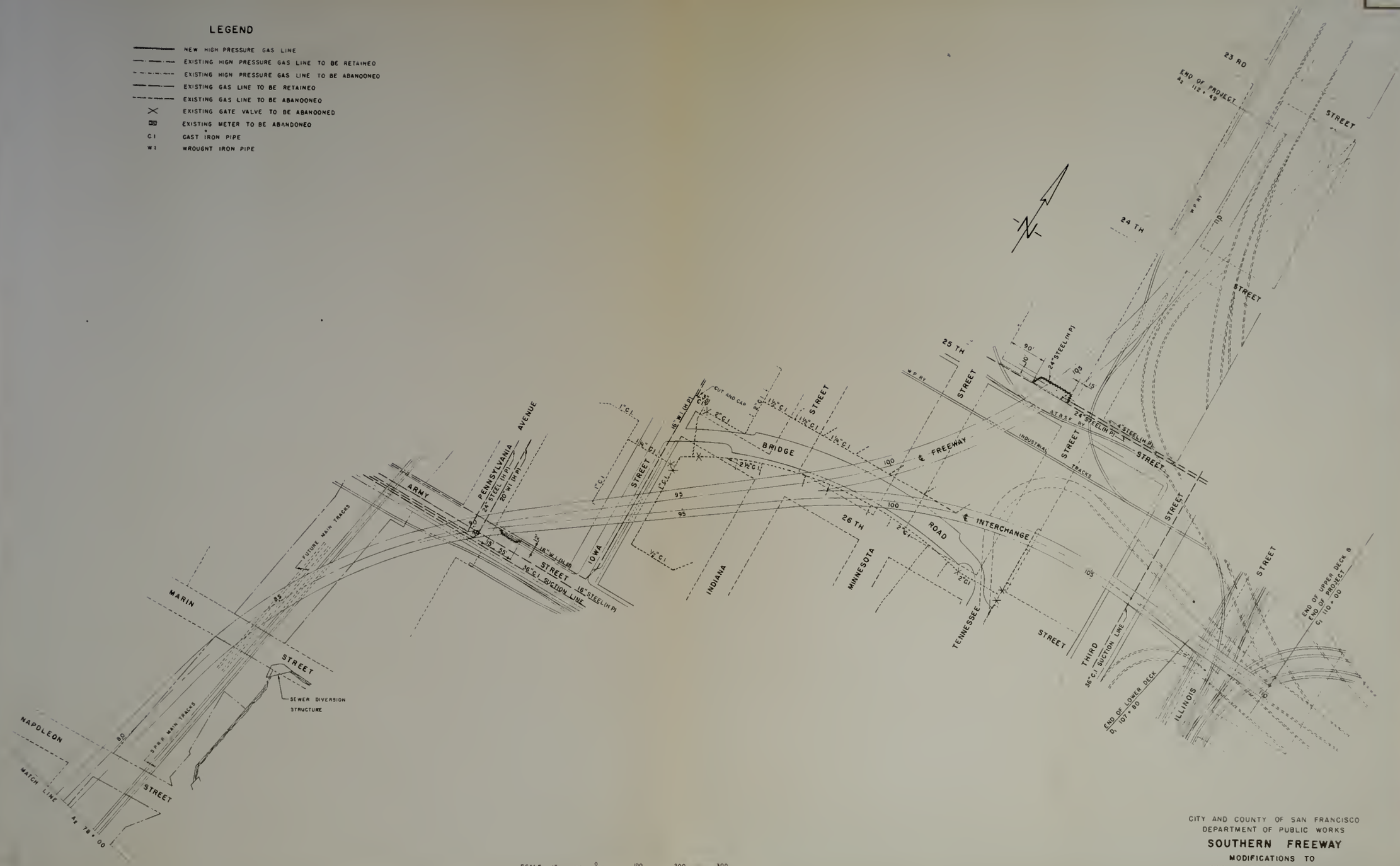
SOUTHERN FREEWAY

MODIFICATIONS TO GAS DISTRIBUTION LINES OAKDALE AVENUE TO EVANS AVENUE

DECEMBER 1955 DWG NO G-19

DE LEUW, CATHER & COMPANY – CONSULTING ENGINEERS – SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO
GAS DISTRIBUTION LINES
EVANS AVENUE TO END OF PROJECT

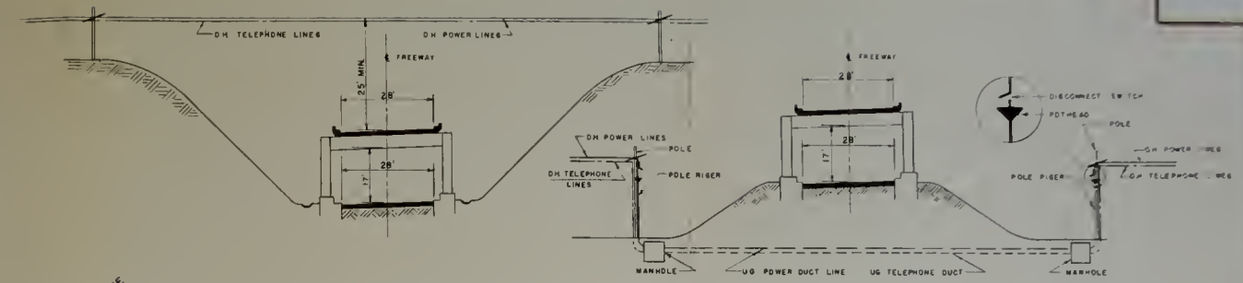
DECEMBER 1955 DWG NO G-20

DE LEUW, CATHER & COMPANY - CONSULTING - ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

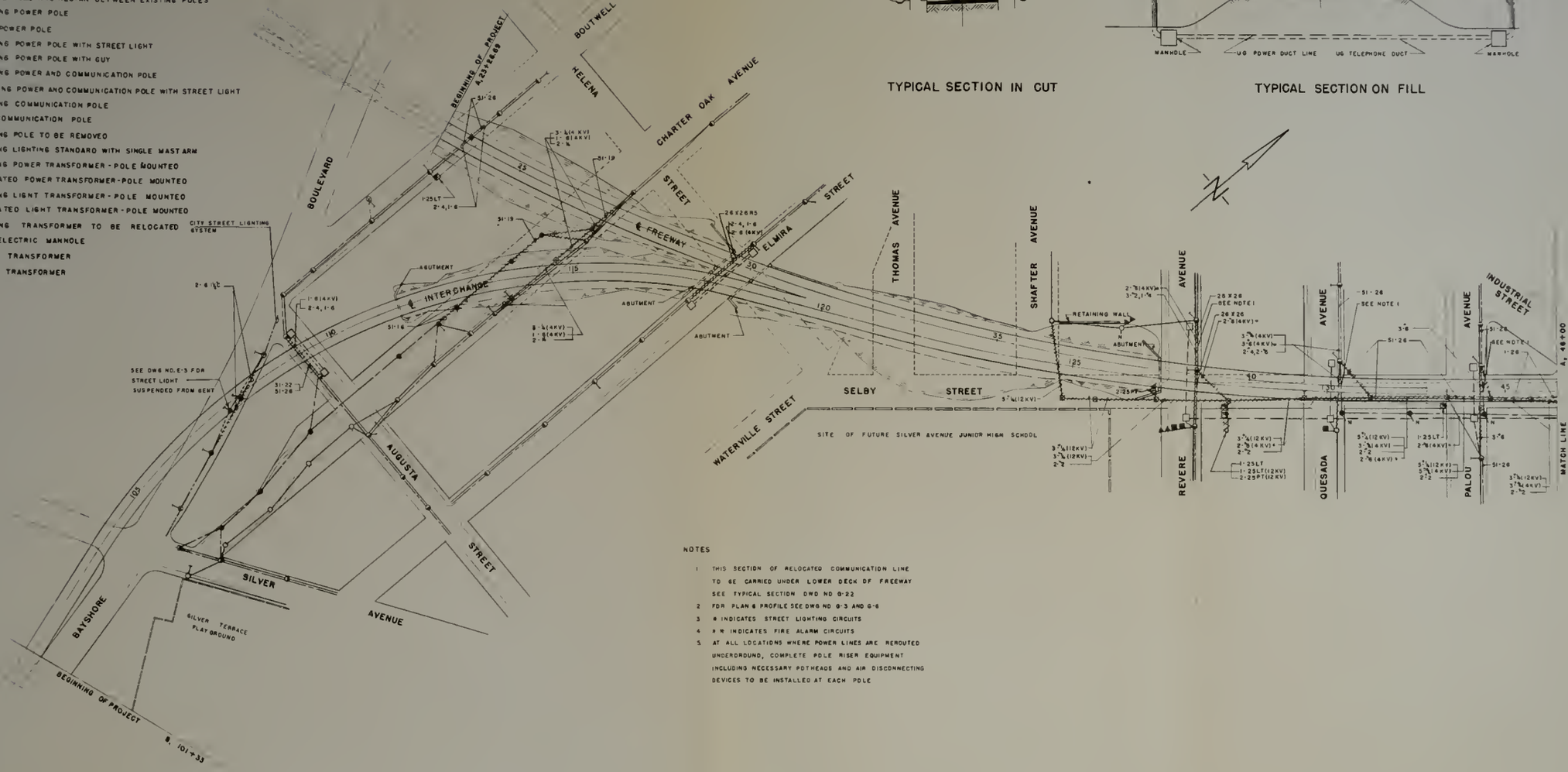
LEGEND

- EXISTING PT&T LINE - OH
- EXISTING PT&T LINE - UG
- NEW PT&T LINE - UG
- EXISTING PG&E POWER LINE - OH
- NEW PG&E POWER LINE - OH
- EXISTING PG&E POWER LINE - UG
- NEW PG&E POWER LINE - UG
- EXISTING LINE TO BE REMOVED
- REMOVE POLE AND RESPAN BETWEEN EXISTING POLES
- EXISTING POWER POLE
- NEW POWER POLE
- EXISTING POWER POLE WITH STREET LIGHT
- EXISTING POWER POLE WITH GUY
- EXISTING POWER AND COMMUNICATION POLE
- EXISTING POWER AND COMMUNICATION POLE WITH STREET LIGHT
- EXISTING COMMUNICATION POLE
- NEW COMMUNICATION POLE
- EXISTING POLE TO BE REMOVED
- EXISTING LIGHTING STANDARD WITH SINGLE MAST ARM
- EXISTING POWER TRANSFORMER - POLE MOUNTED
- RELOCATED POWER TRANSFORMER - POLE MOUNTED
- EXISTING LIGHT TRANSFORMER - POLE MOUNTED
- RELOCATED LIGHT TRANSFORMER - POLE MOUNTED
- EXISTING TRANSFORMER TO BE RELOCATED
- NEW ELECTRIC MANHOLE
- PT POWER TRANSFORMER
- L.T. LIGHT TRANSFORMER



TYPICAL SECTION IN CUT

TYPICAL SECTION ON FILL



NOTES

1. THIS SECTION OF RELOCATED COMMUNICATION LINE TO BE CARRIED UNDER LOWER DECK OF FREEWAY SEE TYPICAL SECTION DWG NO G-22
2. FOR PLAN & PROFILE SEE DWG NO G-3 AND G-6
3. # INDICATES STREET LIGHTING CIRCUITS
4. # M INDICATES FIRE ALARM CIRCUITS
5. AT ALL LOCATIONS WHERE POWER LINES ARE REROUTED UNDERGROUND, COMPLETE POLE RISER EQUIPMENT INCLUDING NECESSARY POTHEADS AND AIR DISCONNECTING DEVICES TO BE INSTALLED AT EACH POLE

SCALE: 1" = 100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO ELECTRICAL DISTRIBUTION AND TELEPHONE LINES
JAMES LICK FREEWAY TO OAKDALE AVENUE
DECEMBER 1955 DWG. NO G-21
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

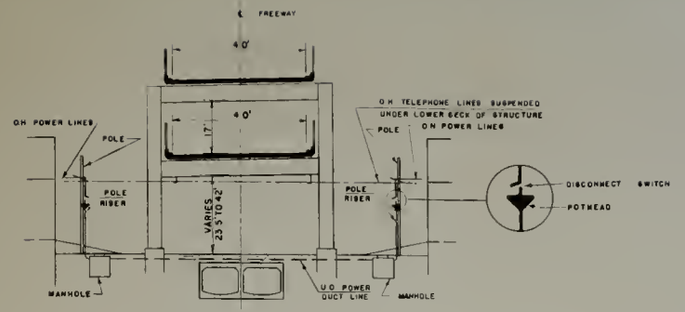
NOTE: THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN.

LEGEND

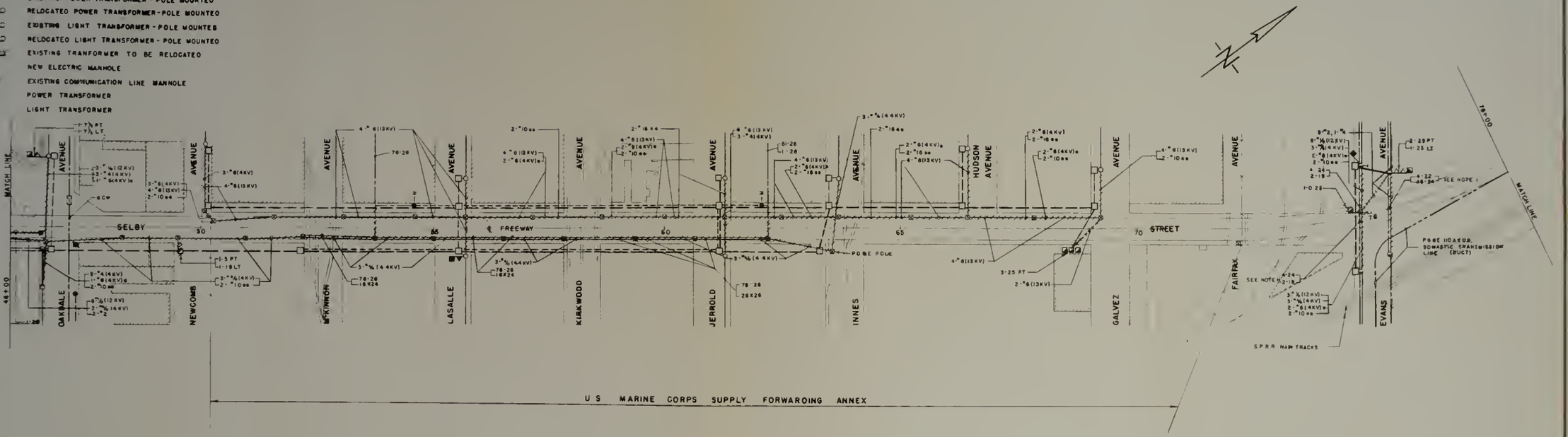
- EXISTING PT&T LINE - OH
- EXISTING PT&T LINE - UG
- NEW PT&T LINE - U.G.
- EXISTING P.G.&E. POWER LINE - O.H.
- NEW P.G.&E. POWER LINE - O.H.
- EXISTING P.G.&E. POWER LINE - U.G.
- NEW P.G.&E. POWER LINE - U.G.
- EXISTING LINE TO BE REMOVED
- REMOVE AND REGRAN BETWEEN EXISTING POLES
- EXISTING POWER POLE
- NEW POWER POLE
- EXISTING POWER POLE WITH STREET LIGHT
- EXISTING POWER POLE WITH GUY
- EXISTING POWER AND COMMUNICATION POLE
- EXISTING POWER AND COMMUNICATION POLE WITH STREET LIGHT
- EXISTING COMMUNICATION POLE
- NEW COMMUNICATION POLE
- EXISTING POLE TO BE REMOVED
- EXISTING POWER TRANSFORMER - POLE MOUNTED
- RELOCATED POWER TRANSFORMER - POLE MOUNTED
- EXISTING LIGHT TRANSFORMER - POLE MOUNTED
- RELOCATED LIGHT TRANSFORMER - POLE MOUNTED
- EXISTING TRANFORMER TO BE RELOCATED
- NEW ELECTRIC MANHOLE
- EXISTING COMMUNICATION LINE MANHOLE

PT POWER TRANSFORMER

LT LIGHT TRANSFORMER



TYPICAL SECTION



NOTES

1. THIS SECTION OF RELOCATED COMMUNICATION LINE TO BE CARRIED UNDER LOWER DECK OF FREEWAY (SEE TYPICAL SECTION)
2. ALL POLES AND CONDUCTORS WITHIN U.S. MARINE CORPS SUPPLY FORWARDING ANNEX BOUNDARIES ARE GOVERNMENT OWNED EXCEPT AS NOTED
3. FOR PLAN AND PROFILE SEE DWG NO. G-4
4. 9 INDICATES STREET LIGHTING CIRCUITS
5. 6R INDICATES FIRE ALARM CIRCUITS
6. AT ALL LOCATIONS WHERE POWER LINE ARE REROUTED UNDERGROUND, COMPLETE POLE RISER EQUIPMENT, INCLUDING, NECESSARY POTHEADS AND AIR DISCONNECTING DEVICES, TO BE INSTALLED AT EACH POLE TO THE MANHOLE LOCATION

SCALE 1" = 100' 0 100 200 300

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

MODIFICATIONS TO ELECTRICAL DISTRIBUTION AND TELEPHONE LINES
OAKDALE AVENUE TO EVANS AVENUE

DECEMBER 1955 DWG NO G-22

DE LEUW, CATHER & COMPANY · CONSULTING ENGINEERS · SAN FRANCISCO

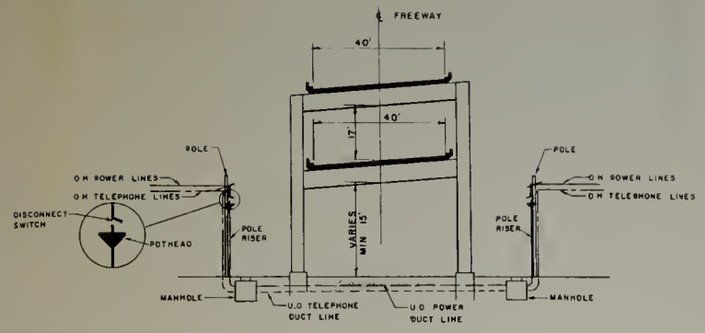
NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

LEGEND

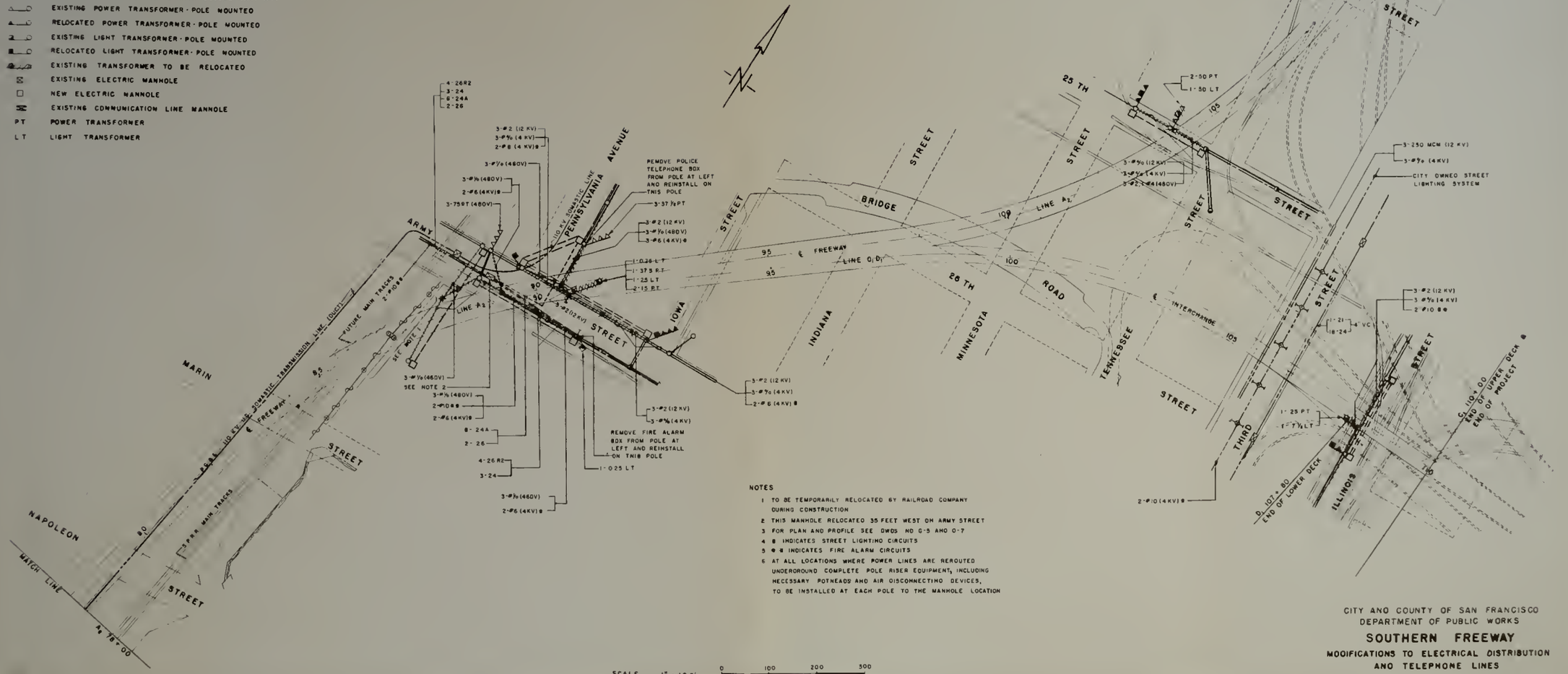
- EXISTING PT&T LINE - O H
- EXISTING PT&T LINE - U G
- NEW PT&T LINE - U G
- EXISTING P G&E POWER LINE - O H
- NEW P G&E POWER LINE - O H
- EXISTING P G&E POWER LINE - U G
- NEW P G&E POWER LINE - U G
- EXISTING RAILROAD COMMUNICATION LINE
- EXISTING LINE TO BE REMOVED
- REMOVE POLE AND RESPAN BETWEEN EXISTING POLES
- EXISTING POWER POLE
- NEW POWER POLE
- EXISTING POWER POLE WITH STREET LIGHT
- EXISTING POWER POLE WITH GUY
- EXISTING POWER AND COMMUNICATION POLE
- EXISTING POWER AND COMMUNICATION POLE WITH STREET LIGHT
- EXISTING COMMUNICATION POLE
- NEW COMMUNICATION POLE
- EXISTING POLE TO BE REMOVED
- EXISTING RAILROAD COMMUNICATION POLE
- EXISTING LIGHTING STANDARD WITH DOUBLE MAST ARM
- EXISTING POWER TRANSFORMER - POLE MOUNTED
- RELOCATED POWER TRANSFORMER - POLE MOUNTED
- EXISTING LIGHT TRANSFORMER - POLE MOUNTED
- RELOCATED LIGHT TRANSFORMER - POLE MOUNTED
- EXISTING TRANSFORMER TO BE RELOCATED
- EXISTING ELECTRIC MANHOLE
- NEW ELECTRIC MANHOLE
- EXISTING COMMUNICATION LINE MANHOLE

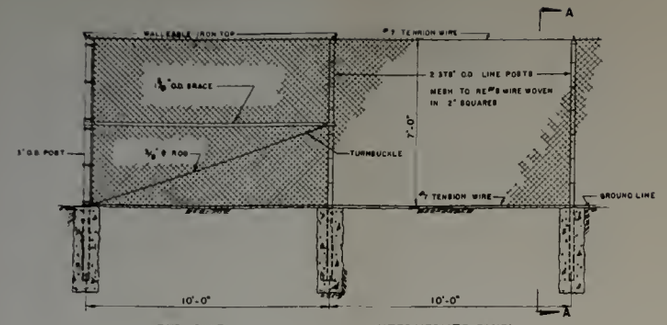
PT POWER TRANSFORMER

LT LIGHT TRANSFORMER

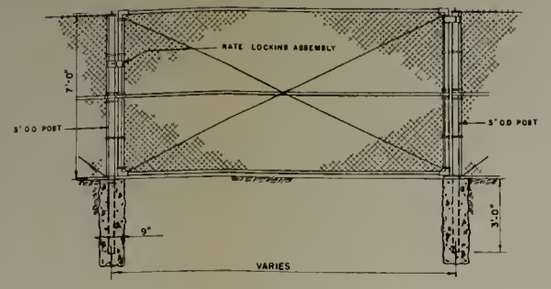


TYPICAL SECTION

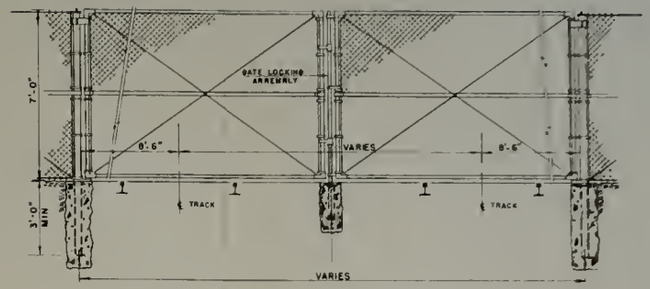

23 RD
END OF PROJECT
AE 112 + 49 00
STREET
24 TH
STREET
25 TH
STREET
BRIDGE
STREET
STREET
STREET



END PANEL INTERMEDIATE PANEL

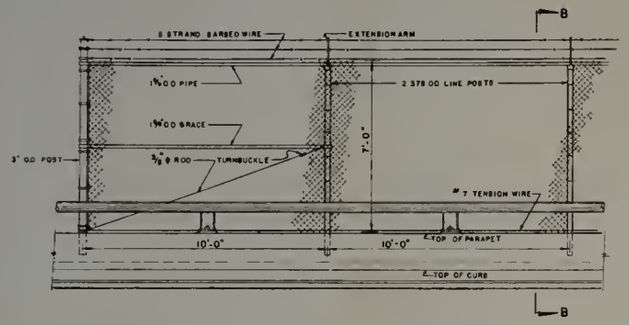


SINGLE GATE



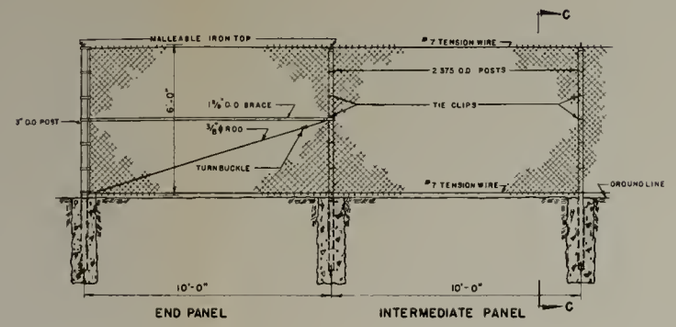
DOUBLE GATE

TEMPORARY SECURITY FENCE THRU U.S.M.C. FORWARDING ANNEX

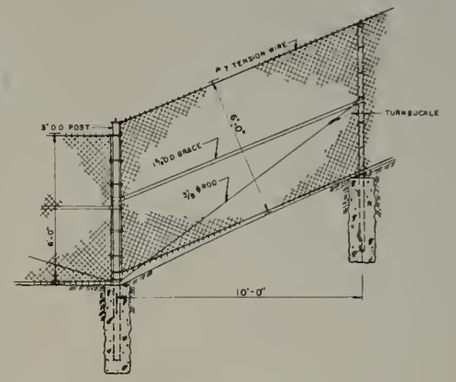


END PANEL INTERMEDIATE PANEL

SECURITY FENCE ON FREEWAY STRUCTURE
THRU U.S.M.C. FORWARDING ANNEX

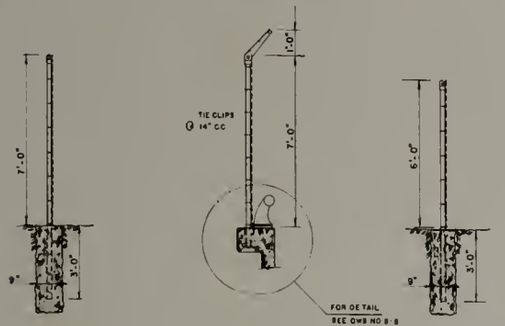


END PANEL INTERMEDIATE PANEL



PANEL AT CHANGE IN GRADE

RIGHT-OF-WAY FENCE



SECTION A-A SECTION B-B SECTION D-D

NOTES:

1. ALL POSTS, MESH, AND ACCESSORIES TO BE HOT DIPPED GALVANIZED
2. ALL POSTS TO BE SET IN CLASS B1 CONCRETE
3. BRACE POSTS TO BE PLACED AT INTERVALS NOT EXCEEDING 1000 FEET
4. ALL MESH TO BE PLACED ON ROADWAY SIDE OF POSTS

SCALE 3/8" = 1'-0" 0 1 2 3 4 5

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

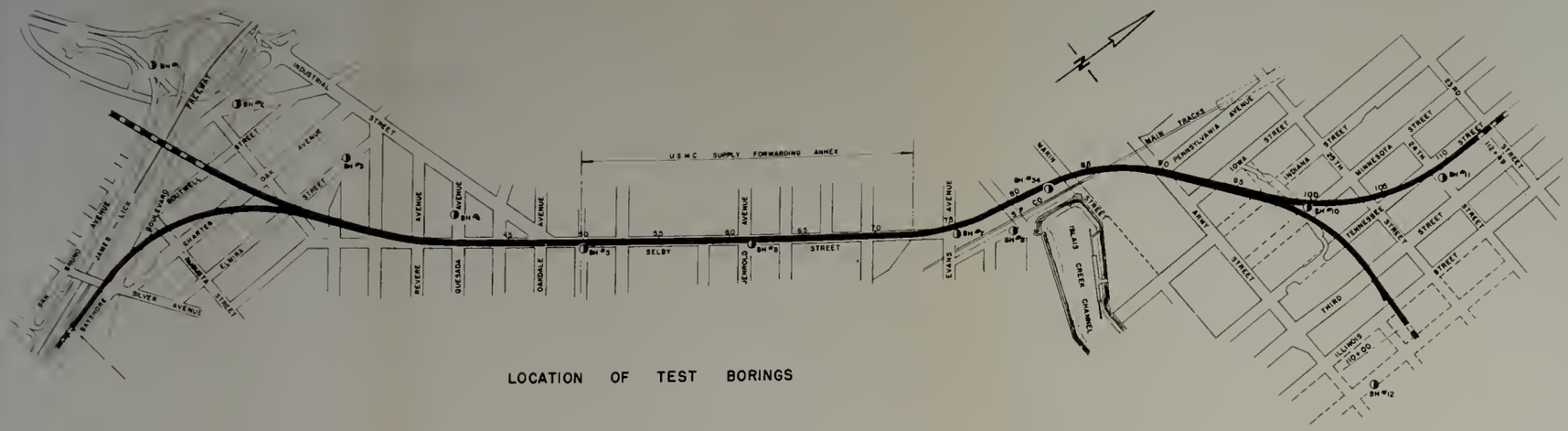
SOUTHERN FREEWAY

FENCE DETAILS

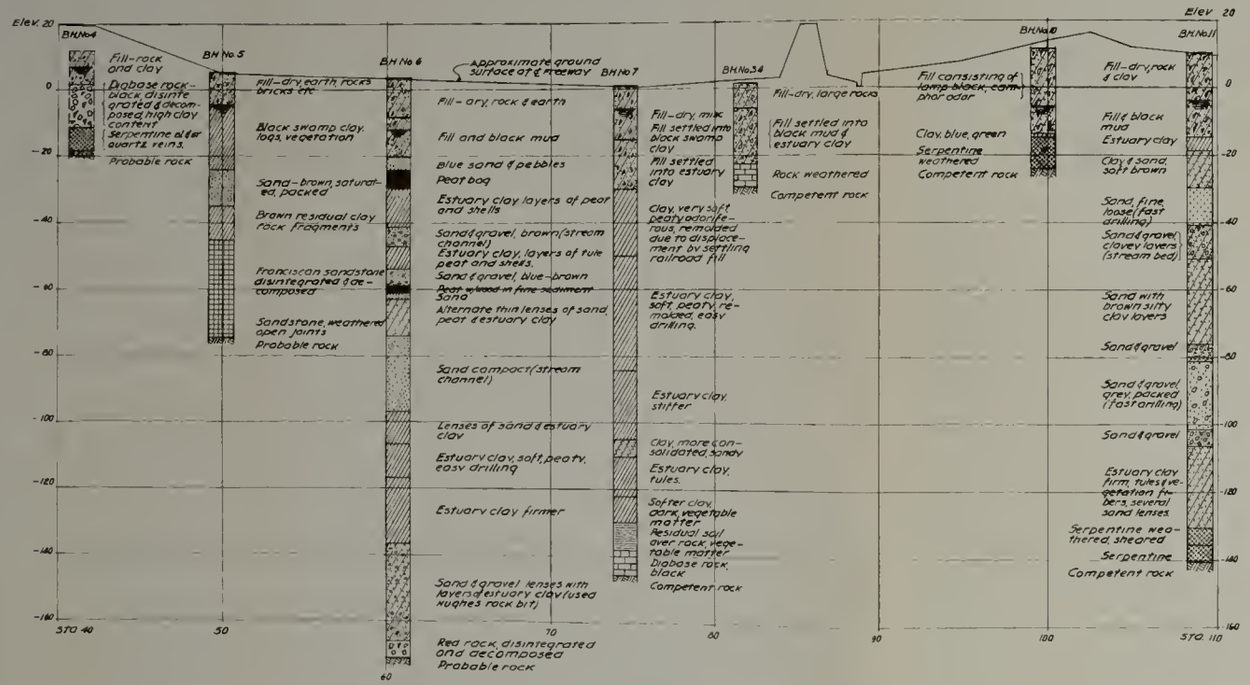
DECEMBER 1955 DWG NO G-24

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



LOCATION OF TEST BORINGS


Elev. 20
BH No 4
BH No 5
BH No 6
BH No 7
BH No 8
BH No 9
BH No 10
BH No 11
Approximate ground surface of freeway
Fill – rock and clay
Diabase rock – black, disinte grated & decom-posed, high clay content Serpentine & fer quartz veins.
Probable rock
Fill – dry, earth, rocks bricks etc
Black swamp clay, logs, vegetation
Sand – brown, saturat-ed, packed
Brown residual clay rock fragments
Franciscan sandstone disintegrated & de – composed
Sandstone, weathered open joints
Probable rock
Fill – dry, rock & earth
Fill and black mud
blue sand & pebbles
Peat bog
Estuary clay layers of peat and shells
Sand & gravel, brown (stream channel)
Estuary clay, layers of tule peat and shells.
Sand & gravel, blue – brown
Peat & wood in fine sediment sand
Alternate thin lenses of sand, peat & estuary clay
Sand compact (stream channel)
Lenses of sand & estuary clay
Estuary clay, soft, peaty, easy drilling
Estuary clay firmer
Sand & gravel lenses with layers of estuary clay (used Hughes rock bit)
Red rock, disintegrated and decomposed
Probable rock
Fill – dry, mix
Fill settled into block swamp clay
Fill settled into estuary clay
Clay, very soft peaty estuarine, remolded due to displace-ment by settling railroad fill
Estuary clay, soft, peaty, re-molded easy drilling.
Estuary clay, stiffer
Clay, more con-solidated, sandy
Estuary clay, tules.
Softer clay, dark, vegetable matter.
Residual soil over rock, vege-table matter.
Diabase rock, black
Competent rock
Fill – dry, large rocks
Fill settled into block mud & estuary clay
Rock weathered
Competent rock
Fill consisting of lamp-black, cam-phor odor
Clay, blue, green
Serpentine weathered
Competent rock
Fill – dry, rock & clay
Fill & black mud
Estuary clay
Clay & sand, soft brown
Sand, fine, loose (fast drilling)
Sand & gravel, clayey layers (stream bed)
Sand with brown silty clay layers
Sand & gravel
Sand & gravel, grey, packed (fast drilling)
Sand & gravel
Estuary clay firm, tules, ve-getation fi-bers, several sand lenses.
Serpentine wea-thered, sheared
Serpentine
Competent rock
STA 40
50
70
60
90
100
STA 110
0
-20
-40
-60
-80
-100
-120
-140
-160

LOG OF TEST BORINGS

LEGEND

Fill
Sandstone
Gravel
Disintegrated rock
Peat or muck
Rock
Sand
Clay
Residual soil
Serpentine
Sand & clay
– Boring Hole
Ground Water Level
Sand, gravel & clay
Weathered rock

Note:
This subsurface data from report on "Investigation of Ground & Water Conditions" by Hyde Forbes dated June 1955.
All elevations refer to City Datum.

SCALES VERTICAL 1" = 20' 0 5 10 20 30 40 50 60
HORIZONTAL 1" = 400' 0 400 800 1000

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
SOUTHERN FREEWAY
SOILS PROFILE
AND
LOGS OF TEST BORINGS
DECEMBER 1955 OWG NO. 6-25
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

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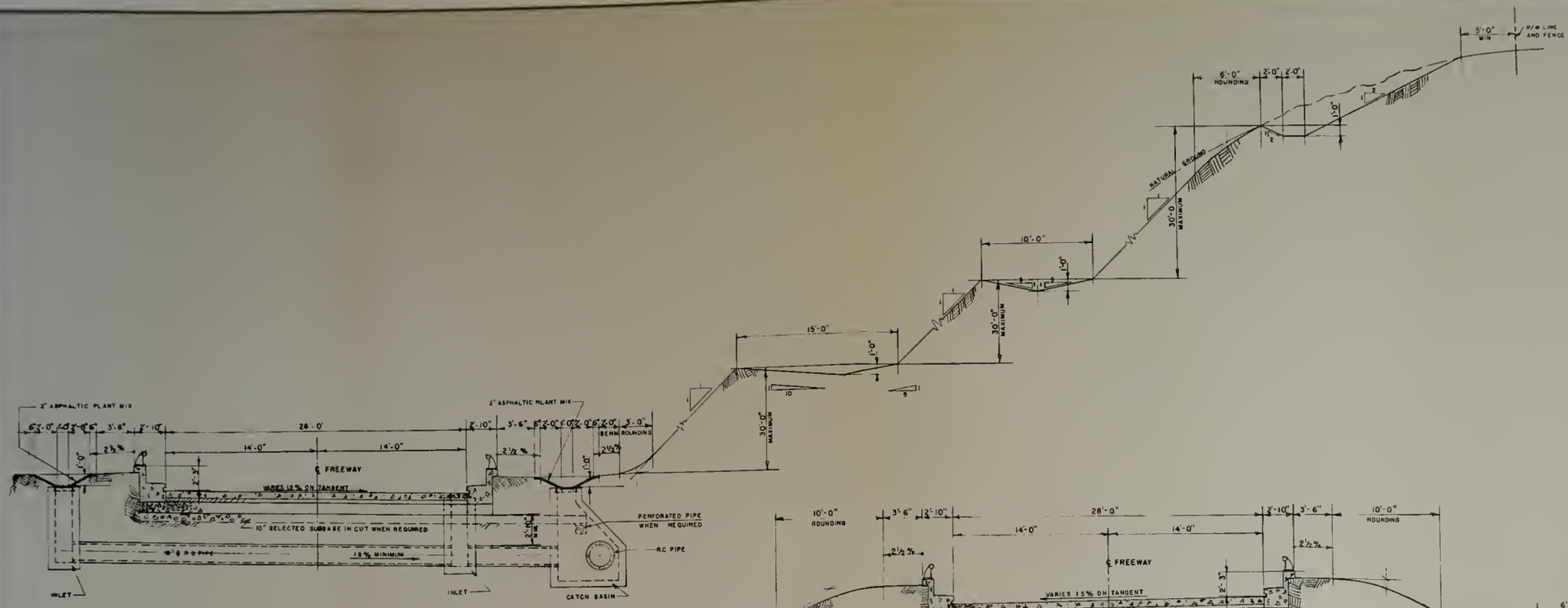
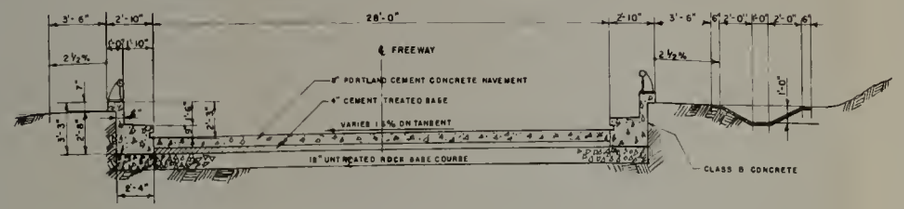


TYPICAL ROADWAY SECTION
BETWEEN BENTS IN CUT
SCALE 1" = 5'-0"

TYPICAL ROADWAY SECTION
BETWEEN BENTS ON FILL
SCALE 1" = 5'-0"



TYPICAL DETAIL
8" P.C.C. PAVEMENT
SCALE 1" = 4'-0"

NOTE:

1. FOR TYPICAL ROADWAY SECTION AT BENTS SEE DWG S-3

SCALE 1" = 5'-0"

SCALE 1" = 4'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

TYPICAL ROADWAY SECTIONS
AND
PAVEMENT DETAILS

DECEMBER 1955 DWG. NO. G-26

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

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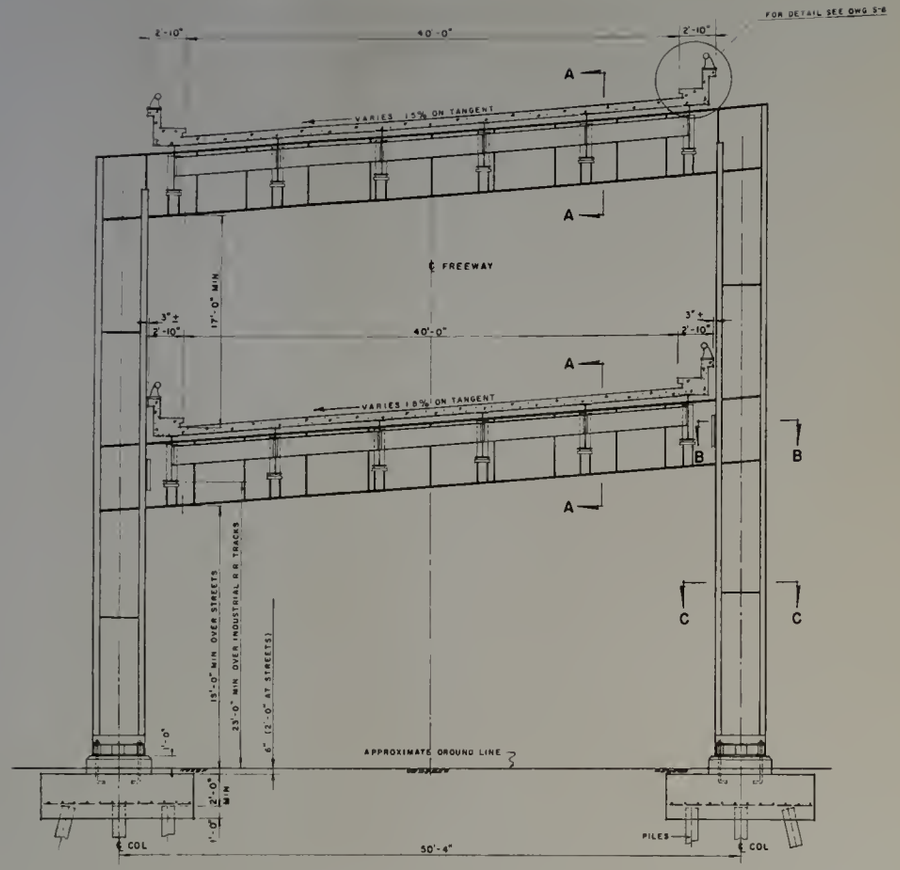
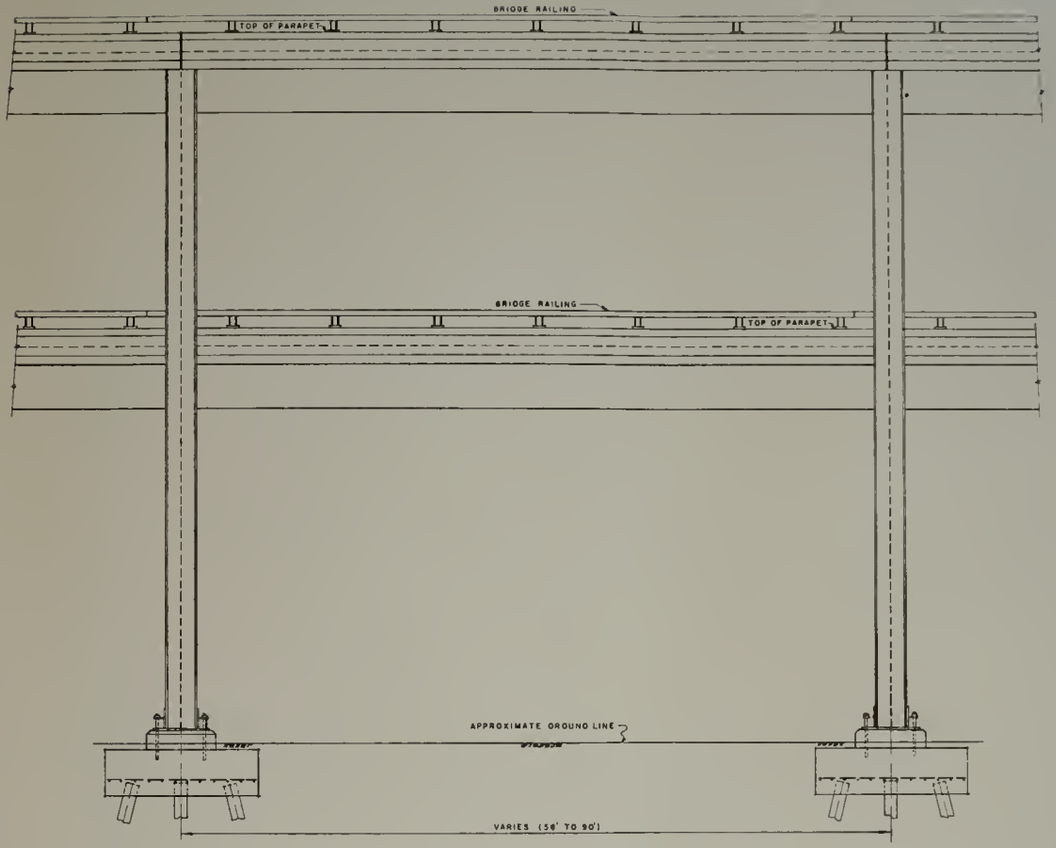
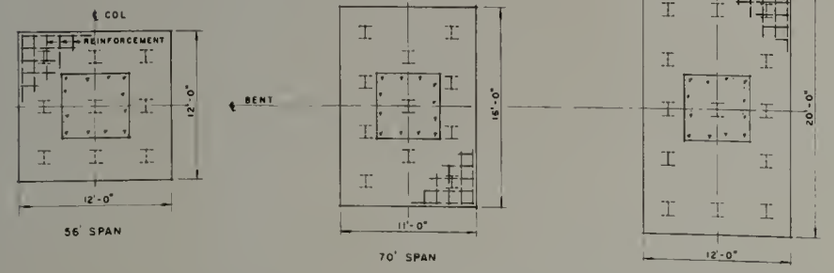


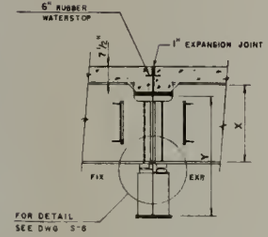
TYPICAL SECTION



TYPICAL ELEVATION

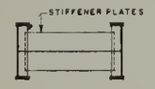


TYPICAL FOOTINGS



SECTION A-A

SCALE 3/8"=1'-0"



SECTION C-C

SCALE 3/8"=1'-0"

SECTION B-B

SCALE 3/8"=1'-0"

SPAN	X	Y	PLATE A	PLATE B	PLATE C
56'	36"	60"	48" X ½"	27" X ¾"	6" X 1"
70'	42"	60"	48" X ⅝"	27" X ¾"	6" X 1½"
90'	60"	66"	48" X ⅝"	30" X ¾"	6" X 2"

SCALE 3/16"=1'-0"

3/8"=1'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

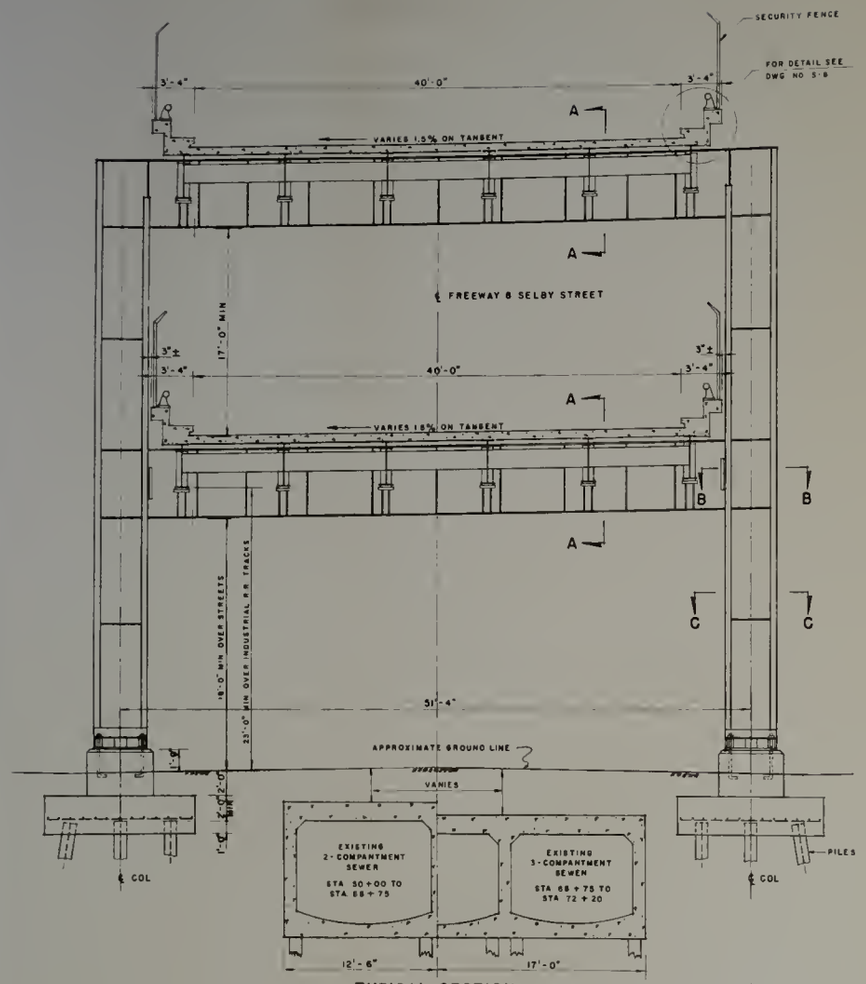
SOUTHERN FREEWAY

3 LANE, 2 LEVEL VIADUCT
TYPICAL SECTION AND ELEVATION
PORTION OUTSIDE U.S.M.C. ANNEX

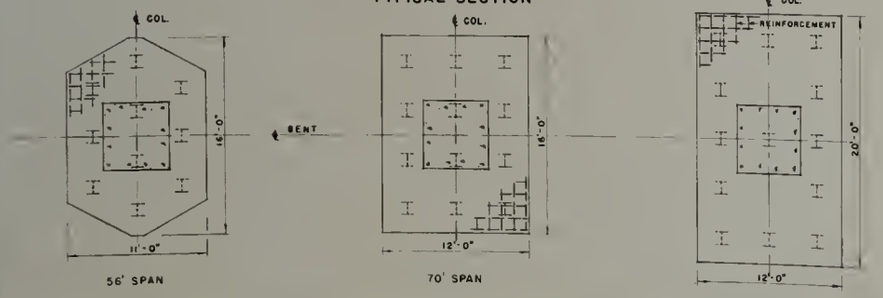
DECEMBER 1955 DWG. NO. S-1

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

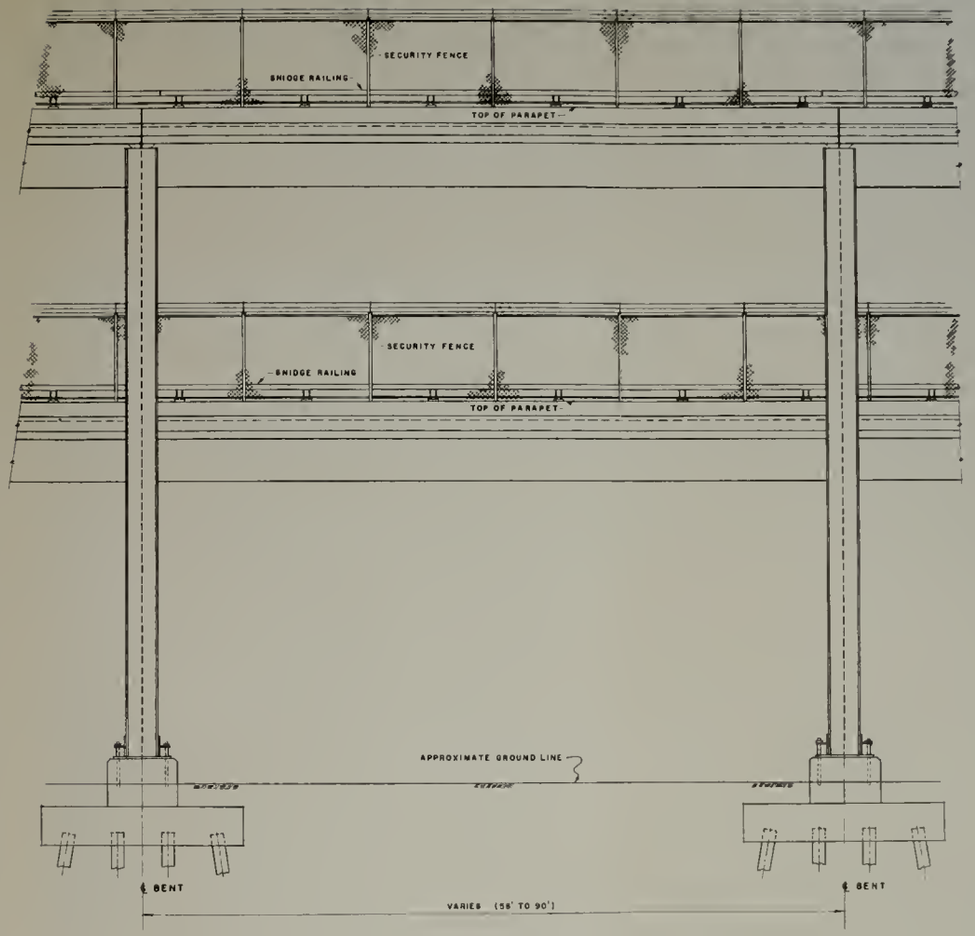
NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



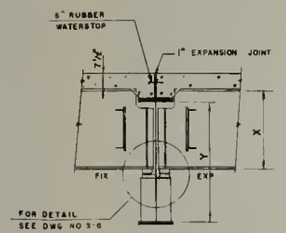
TYPICAL SECTION



TYPICAL FOOTINGS

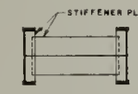


TYPICAL ELEVATION



SECTION A-A

SCALE 3/8" = 1'-0"



SECTION C-C

SCALE 3/8" = 1'-0"

SECTION B-B

SCALE 3/8" = 1'-0"

SPAN	X	Y	PLATE A	PLATE B	PLATE C
58'	38"	80"	48" X ½"	27" X ¾"	8" X 1"
70'	42"	80"	48" X ⅝"	27" X ¾"	6" X 1½"
90'	80"	86"	48" X ⅝"	30" X ¾"	6" X 2"

SCALE 3/16" = 1'-0" 0 1 2 3 4 5 10

3/8" = 1'-0" 0 1 2 3 4 5

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

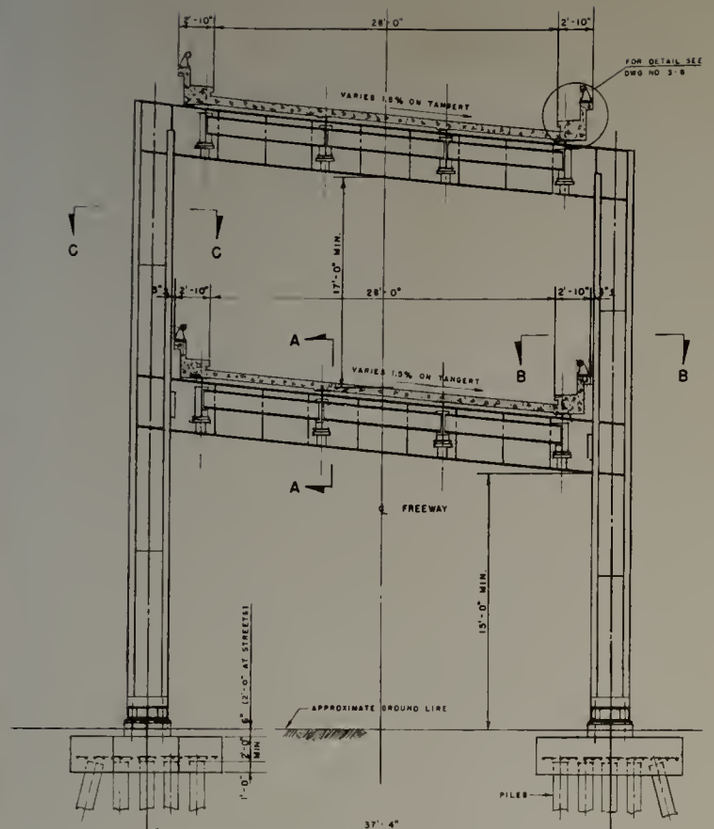
SOUTHERN FREEWAY

3 LANE, 2 LEVEL VIADUCT
TYPICAL SECTION AND ELEVATION
PORTION THROUGH U.S.M.C. ANNEX

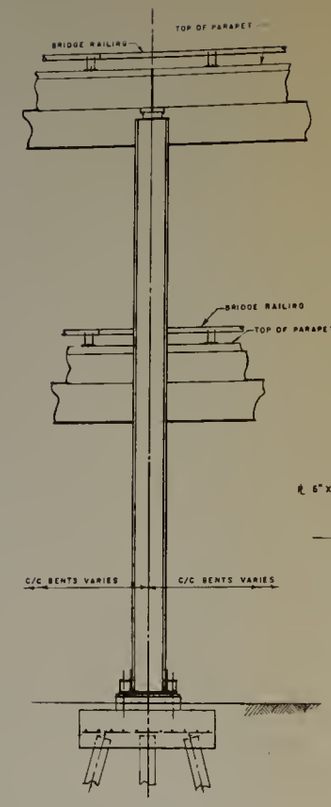
DECEMBER 1955 DWG NO. S-2

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

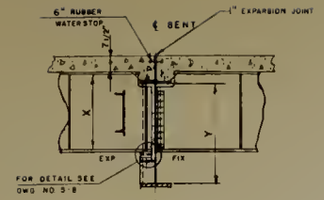
NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



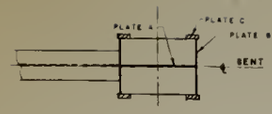
TYPICAL SECTION
28'-0" ROADWAY - TWO LEVEL
SCALE 3/16" = 1'-0"



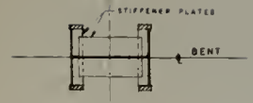
ELEVATION



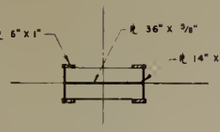
SECTION A-A
SCALE 3/8" = 1'-0"



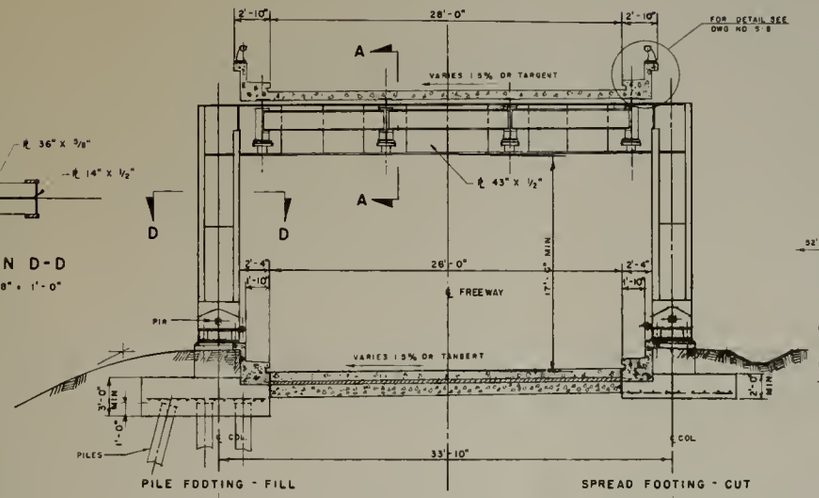
SECTION B-B
SCALE 3/8" = 1'-0"



SECTION C-C
SCALE 3/8" = 1'-0"

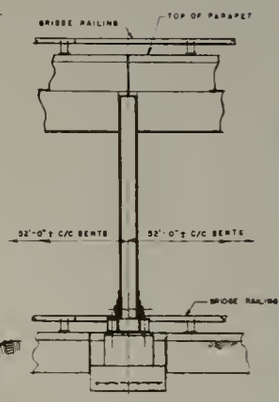


SECTION D-D
SCALE 3/8" = 1'-0"



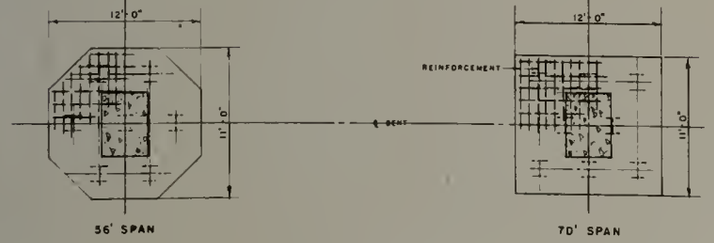
PILE FOOTING - FILL
SPREAD FOOTING - CUT

TYPICAL SECTION
26'-0" ROADWAY - SINGLE LEVEL
SCALE 3/16" = 1'-0"



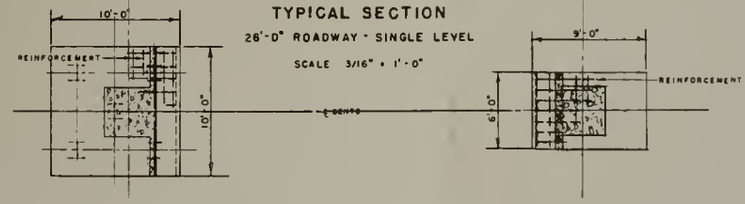
ELEVATION

SPAN	X	Y	PLATE A	PLATE B	PLATE C
56'	36	48	36 X 1/2	24 X 1/2	6 X 7/8
70'	42	54	36 X 1/2	24 X 1/2	6 X 1 3/8
90'	60	63	36 X 1/2	24 X 1/2	6 X 2



56' SPAN
70' SPAN

TYPICAL FOOTINGS

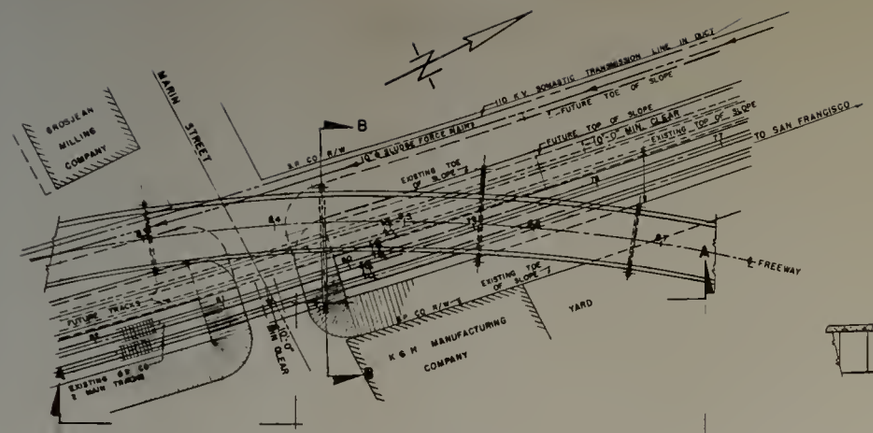


TYPICAL FOOTINGS

SCALE
3/16" = 1'-0"
3/8" = 1'-0"

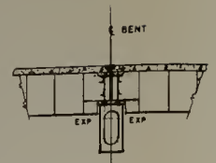
CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
SOUTHERN FREEWAY
2 LANE VIADUCTS
TYPICAL SECTIONS AND ELEVATIONS
DECEMBER 1955 DWG NO. S-3
DE LEUW CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



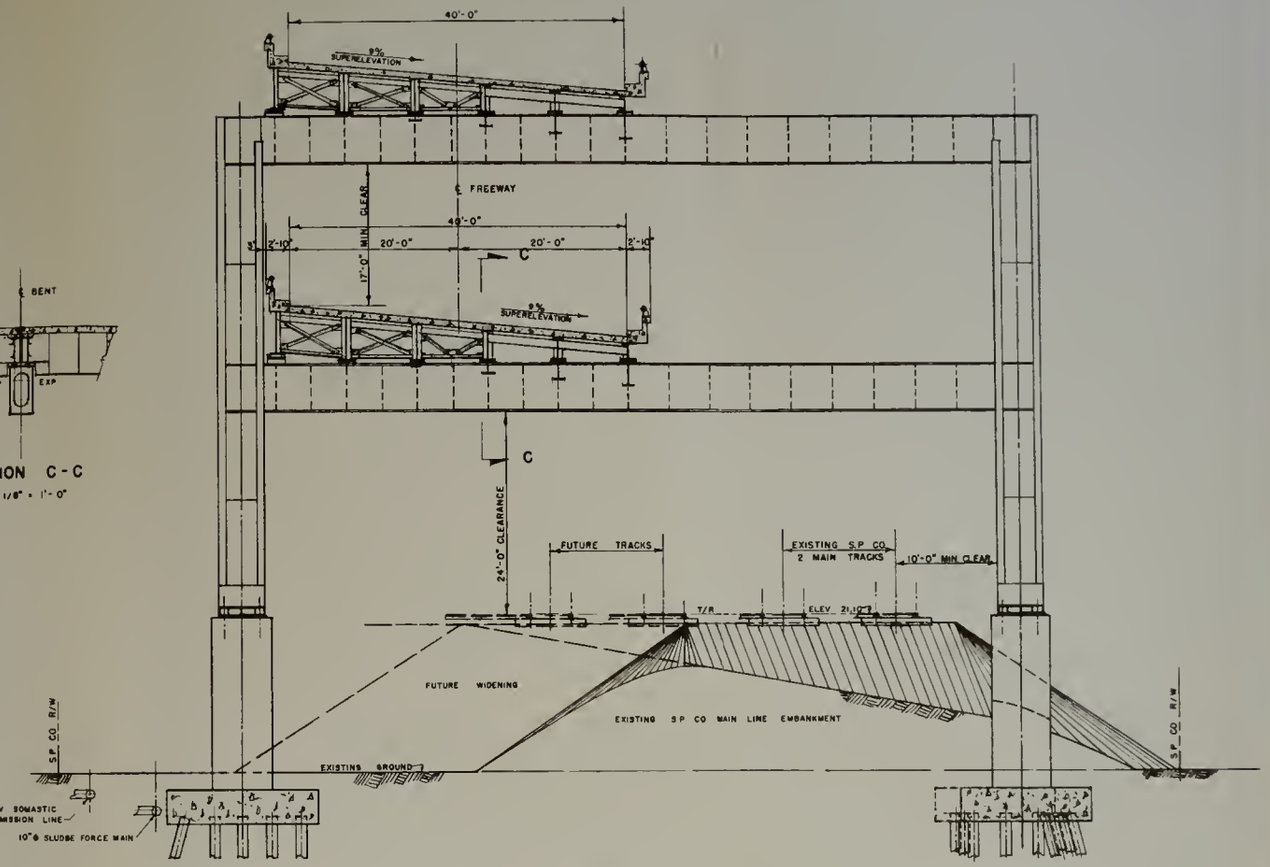
PLAN AT CROSSING OF
SOUTHERN PACIFIC COMPANY MAIN TRACKS

SCALE 1" = 50'-0"



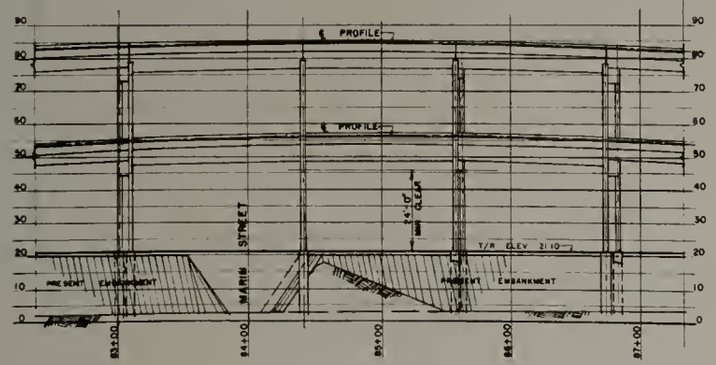
SECTION C - C

SCALE 1/8" = 1'-0"



SECTION B-B

SCALE 1/8" = 1'-0"



ELEVATION A - A

SCALE
HORIZONTAL 1" = 50'-0"
VERTICAL 1" = 20'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

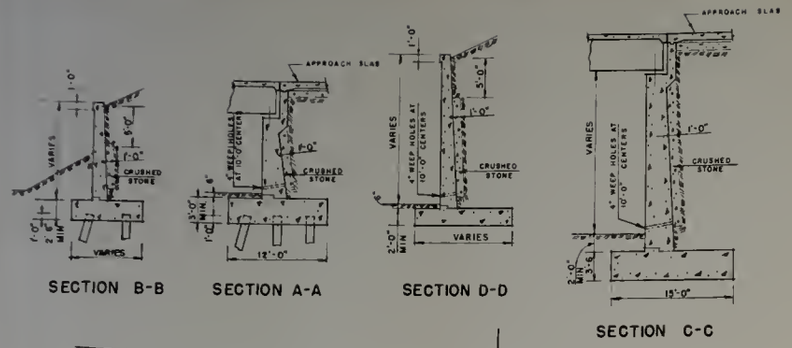
SOUTHERN FREEWAY

CROSSING AT S P CO. MAIN TRACKS
PLAN, ELEVATION, AND SECTION

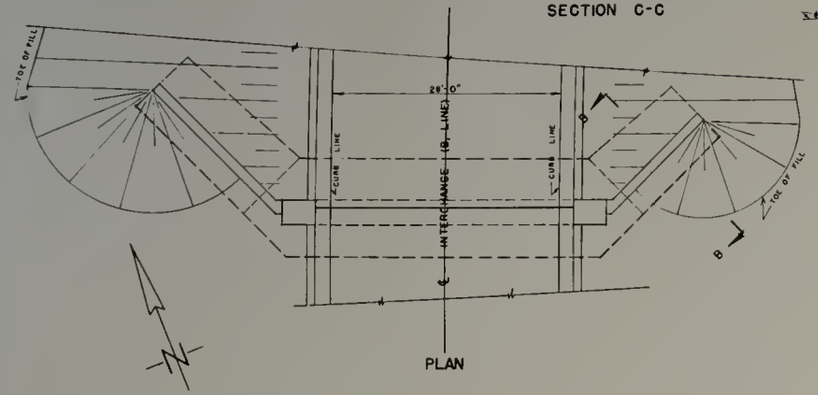
DECEMBER 1955 OWG NO S-4

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

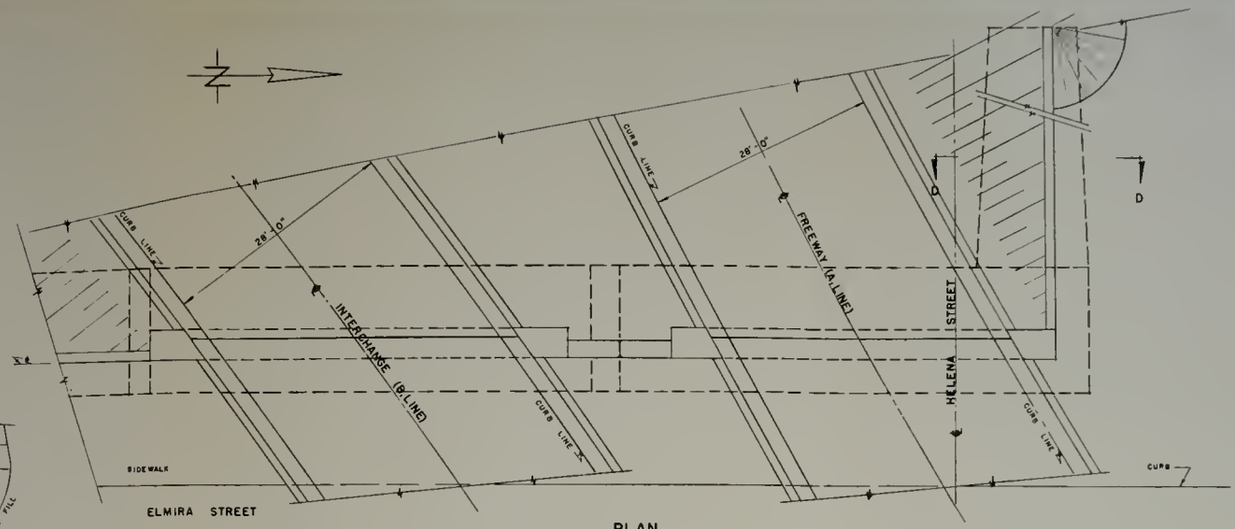
NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN



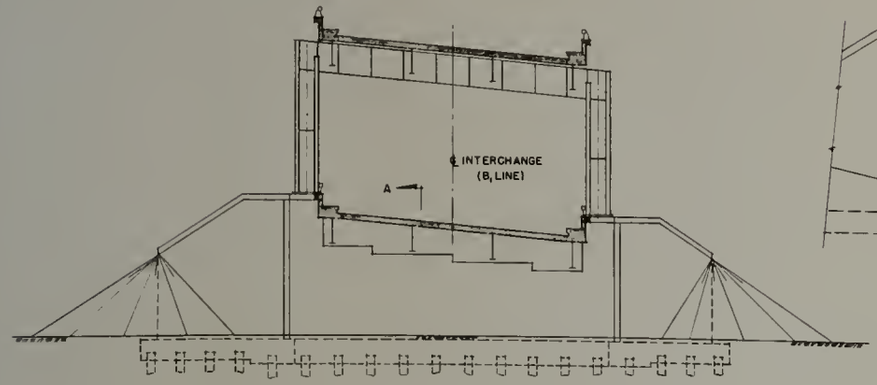
SECTION B-B SECTION A-A SECTION D-D SECTION C-C



PLAN

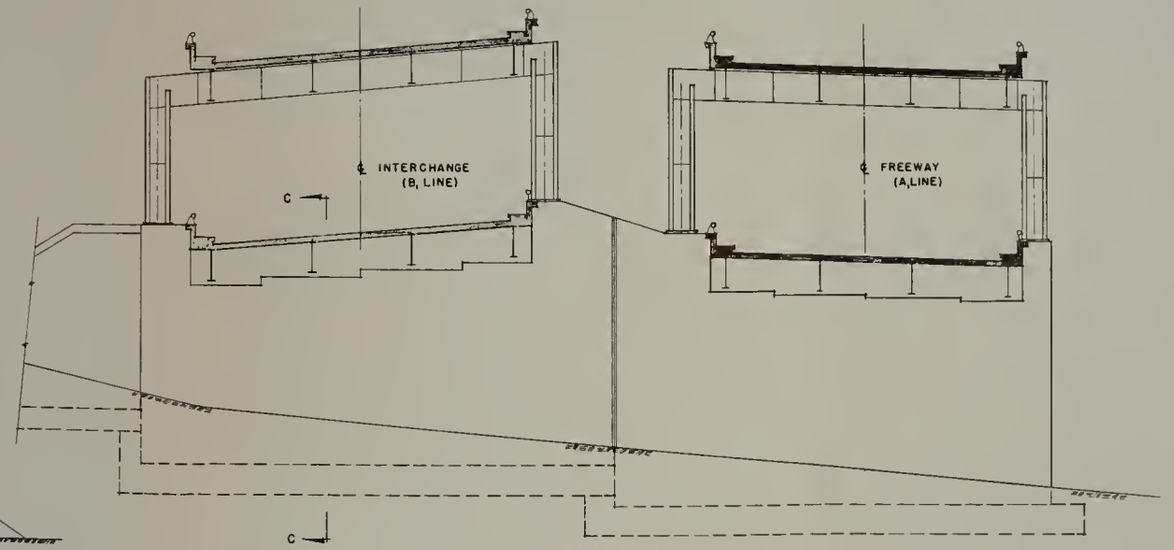


PLAN



ELEVATION

ABUTMENT AT STA. 111+50 B_1



ELEVATION

ABUTMENT AT STA. 117+60 B_1

STA. 29+48 A_1

SCALE ½" = 1'-0" 0 1 2 3 4 5 10 15

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

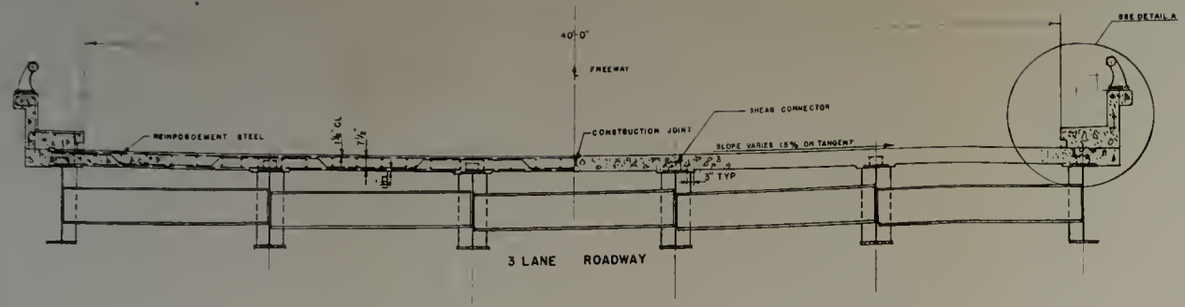
SOUTHERN FREEWAY

ABUTMENTS
PLAN, ELEVATION & SECTIONS

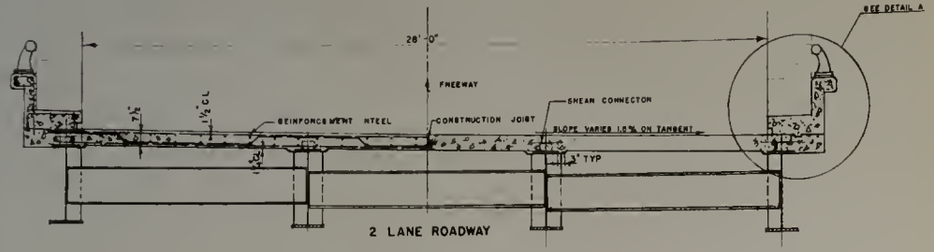
DECEMBER 1955 OWG NO. S-5

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

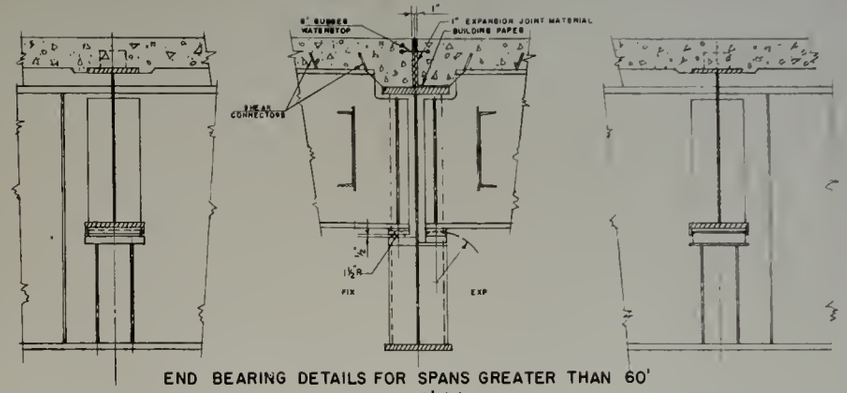


3 LANE ROADWAY

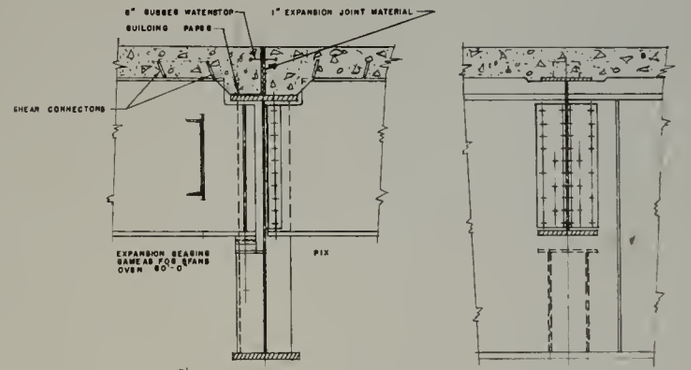


2 LANE ROADWAY

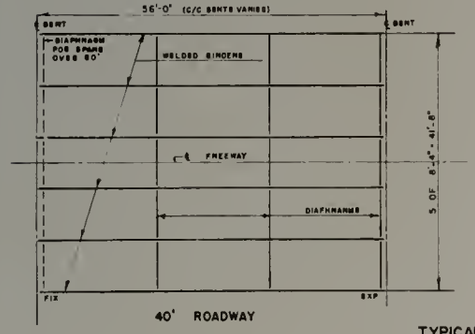
TYPICAL SECTIONS OF SUPERSTRUCTURE
SCALE 3/8" = 1'-0"



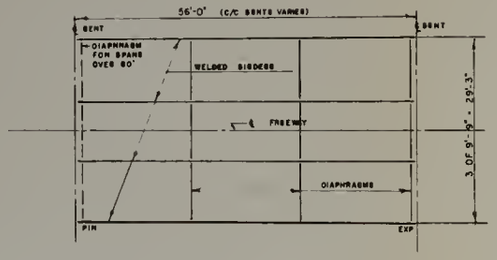
END BEARING DETAILS FOR SPANS GREATER THAN 60'
SCALE 3/4" = 1'-0"



END DETAILS FOR SPANS 60' AND LESS
SCALE 3/4" = 1'-0"

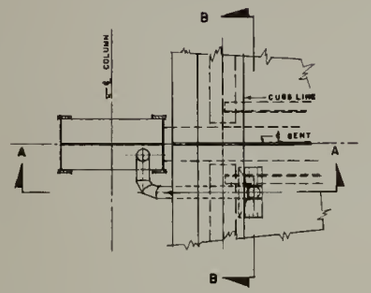


40' ROADWAY

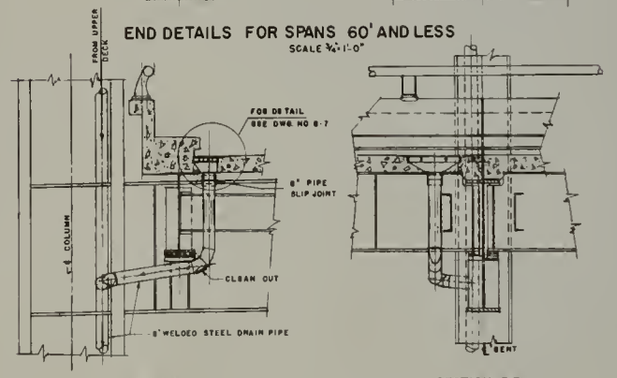


28' ROADWAY

TYPICAL FRAMING PLAN
SCALE 3/32" = 1'-0"



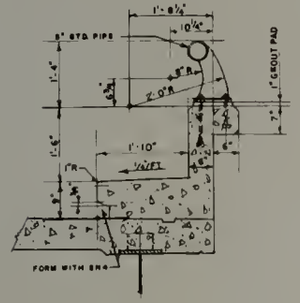
PLAN



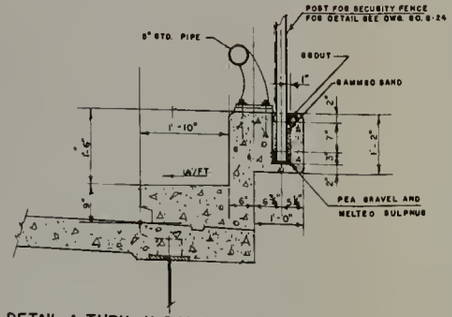
SECTION A-A

SECTION B-B

DECK DRAINAGE DETAIL
SCALE 3/8" = 1'-0"



DETAIL A
SCALE 3/4" = 1'-0"



DETAIL A THRU U.S.M.C. ANNEX
SCALE 3/4" = 1'-0"

SCALES
3/32" = 1'-0"
3/8" = 1'-0"
3/4" = 1'-0"

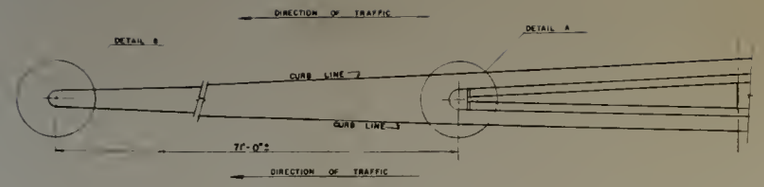
CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS
SOUTHERN FREEWAY

SUPERSTRUCTURE DETAILS

DECEMBER 1955 DWG NO S-6

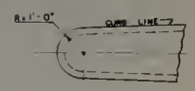
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN.

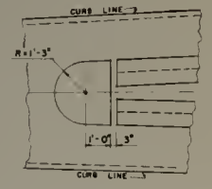


PLAN

SCALE 1/8" = 1'-0"



PLAN

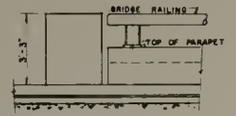


PLAN

ELEVATION

DETAIL B

SCALE 3/8" = 1'-0"

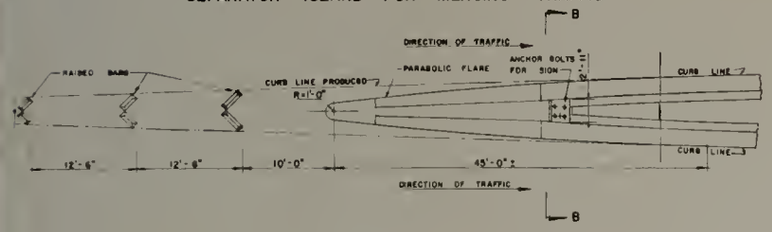


ELEVATION

DETAIL A

SCALE 3/8" = 1'-0"

SEPARATOR ISLAND FOR MERGING TRAFFIC

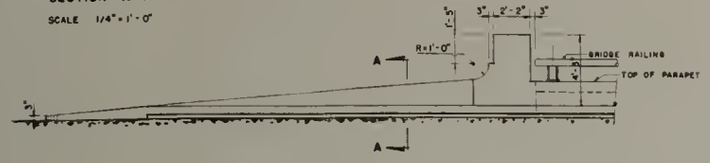


PLAN

SCALE 1/8" = 1'-0"

SECTION A-A

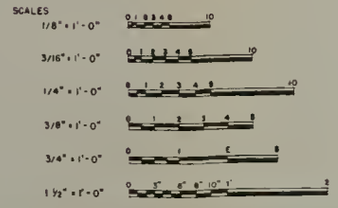
SCALE 1/4" = 1'-0"

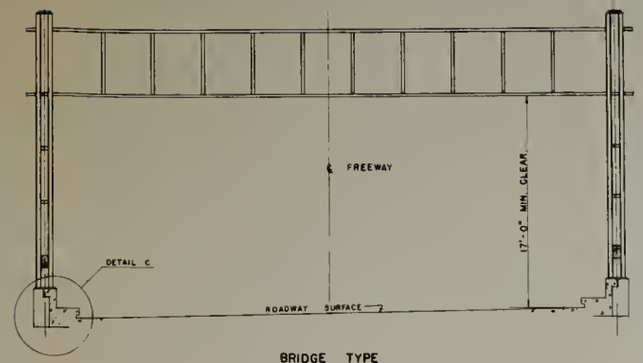


ELEVATION

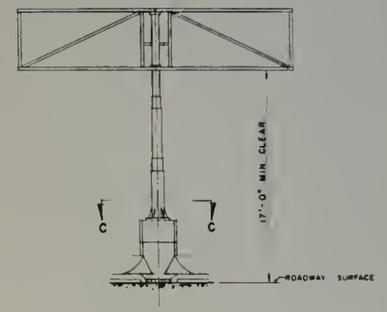
SCALE 1/4" = 1'-0"

ISLAND NOSE FOR DIVERGING TRAFFIC





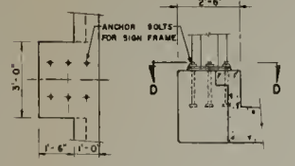
BRIDGE TYPE



PEDESTAL TYPE

FRAMES FOR ROADWAY SIGNS

SCALE 3/16" = 1'-0"



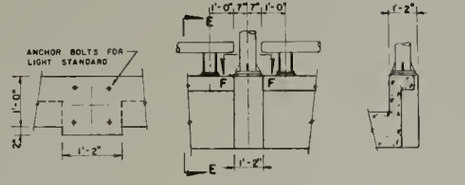
PLAN D-D

SCALE 3/8" = 1'-0"

DETAIL C

SCALE 3/8" = 1'-0"

BRIDGE SIGN BASE



PLAN F-F

SCALE 3/4" = 1'-0"

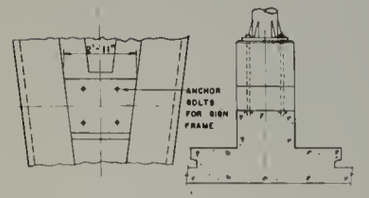
ELEVATION

SCALE 3/8" = 1'-0"

SECTION E-E

SCALE 3/8" = 1'-0"

LIGHT STANDARD BASE DETAIL



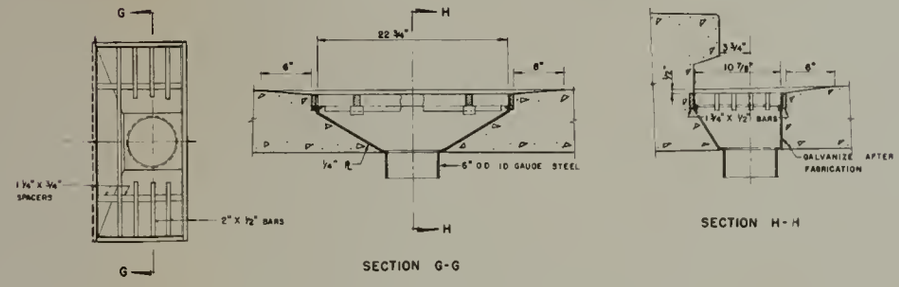
PLAN C-C

SCALE 3/8" = 1'-0"

SECTION B-B

SCALE 3/8" = 1'-0"

PEDESTAL SIGN BASE



PLAN

SECTION G-G

SECTION H-H

DECK DRAIN DETAIL

SCALE 1 1/2" = 1'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

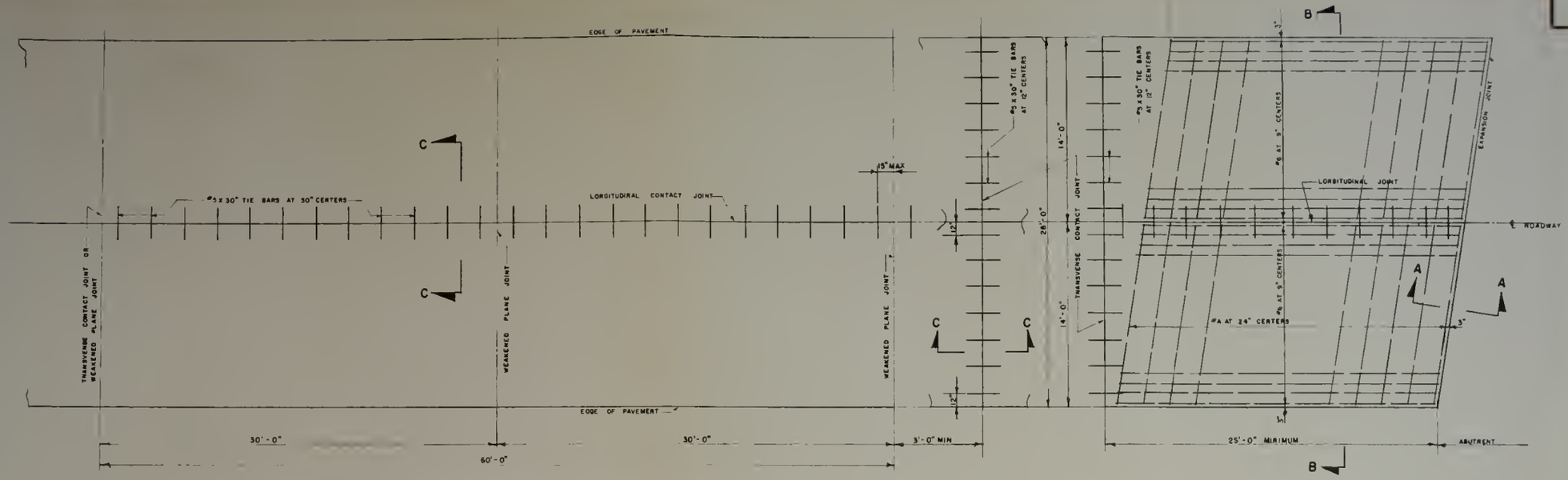
SOUTHERN FREEWAY

MISCELLANEOUS DETAILS

DECEMBER 1955 DWG NO S-7

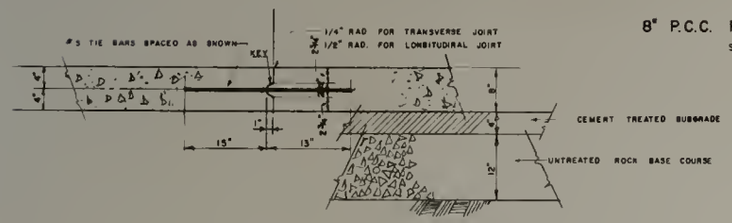
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN.



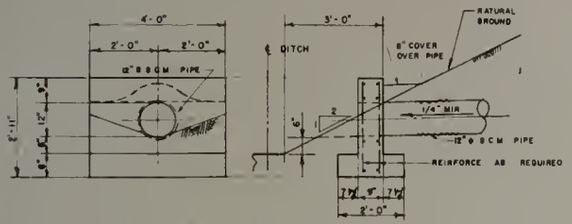
8" P.C.C. PAVEMENT AT GRADE

SCALE 1" = 4'-0"



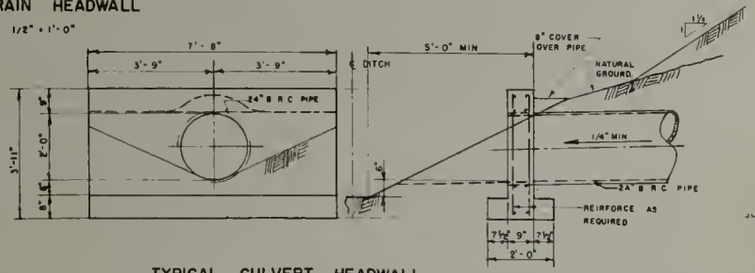
SECTION C-C

SCALE 1" = 1'-0"



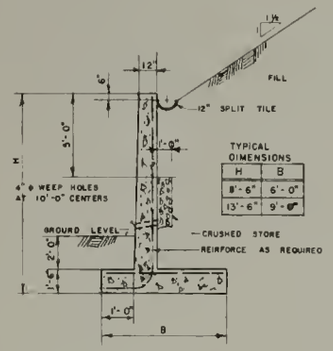
TYPICAL DRAIN HEADWALL

SCALE 1/2" = 1'-0"



TYPICAL CULVERT HEADWALL

SCALE 1/2" = 1'-0"



TYPICAL RETAINING WALL

NO SCALE

NOTES

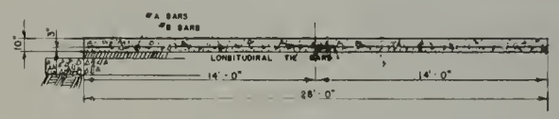
1 RETAINING WALL AND FOOTING TO BE CLASS A, CONCRETE

2 HEADWALLS AND APPROACH SLAB TO BE CLASS B CONCRETE

3 8" R.C.C. PAVEMENT AT GRADE TO BE CLASS E CONCRETE

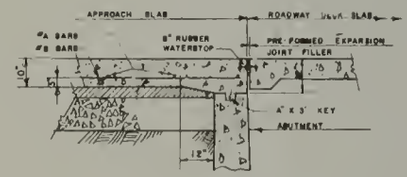
PLAN OF APPROACH SLAB

SCALE 1" = 4'-0"



SECTION B-B

SCALE 1" = 4'-0"



SECTION A-A

SCALE 1/2" = 1'-0"

SCALES

1" = 4'-0" 0 1 2 3 4 8

1/2" = 1'-0" 0 1 2 3 4 8

1" = 1'-0" 0 1 2 3

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

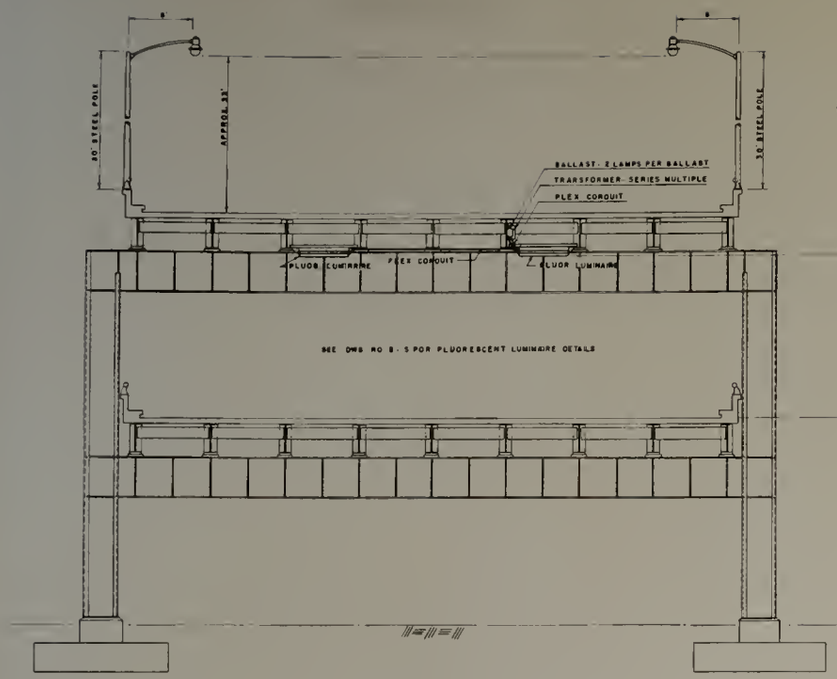
SOUTHERN FREEWAY

RETAINING WALL, APPROACH SLAB AND PAVEMENT DETAILS

DECEMBER 1955 DWG NO S-8

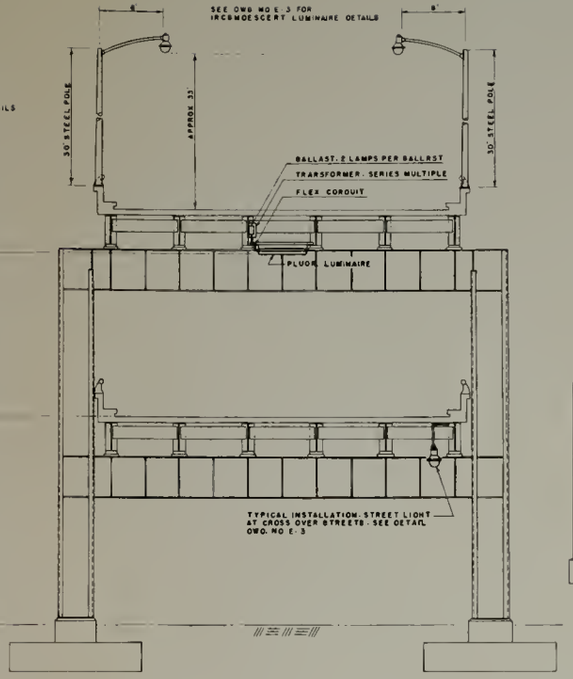
DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN


30' STEEL POLE
APPROX. 33'
BALLAST - 2 LAMPS PER BALLAST
TRANSFORMER - SERIES MULTIPLE
FLEX CONDUIT
FLUOR. LUMINAIRE
SEE DWG NO E-3 FOR LIGHTING STANDARD DETAILS
SEE DWG NO E-5 FOR FLUORESCENT LUMINAIRE DETAILS
12'-0" MIN CLEAR TO FLUOR LUMINAIRE

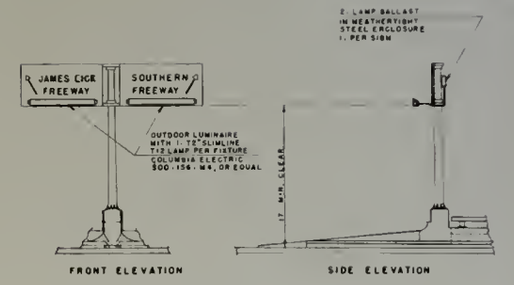
ELEVATION B-B

SCALE 1/8"=1'-0"


SEE DWG NO E-3 FOR INCANDESCENT LUMINAIRE DETAILS
30' STEEL POLE
APPROX. 33'
BALLAST - 2 LAMPS PER BALLAST
TRANSFORMER - SERIES MULTIPLE
FLEX CONDUIT
FLUOR. LUMINAIRE
TYPICAL INSTALLATION - STREET LIGHT AT CROSS OVER STREETS - SEE DETAIL DWG. NO E-3

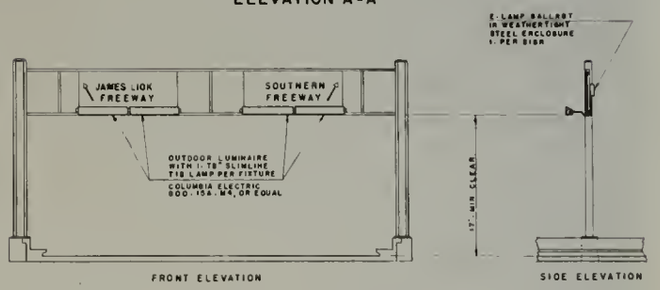
ELEVATION C-C

SCALE 1/8"=1'-0"


2 LAMP BALLAST IN WEATHERTIGHT STEEL ENCLOSURE 1 PER SIGN
JAMES LICK FREEWAY
SOUTHERN FREEWAY
OUTDOOR LUMINAIRE WITH 1 - T8" SLIMLINE T12 LAMP PER FIXTURE COLUMBIA ELECTRIC 500-156-M4, OR EQUAL
17' MIN. CLEAR
FRONT ELEVATION
SIDE ELEVATION

TYPICAL SIGN FRAME & SIGNS AT NOSE WITH SLIMLINE LUMINAIRES - UPPER DECK

ELEVATION A-A


2 LAMP BALLAST IN WEATHERTIGHT STEEL ENCLOSURE 1 PER SIGN
JAMES LICK FREEWAY
SOUTHERN FREEWAY
OUTDOOR LUMINAIRE WITH 1 - T8" SLIMLINE T12 LAMP PER FIXTURE
COLUMBIA ELECTRIC 500-156-M4, OR EQUAL
17' MIN. CLEAR
FRONT ELEVATION
SIDE ELEVATION

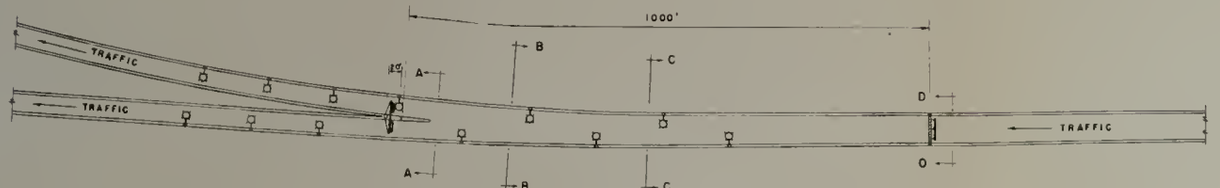
TYPICAL SIGN FRAME & SIGNS WITH SLIMLINE LUMINAIRES - UPPER DECK

DIRECTIONAL SIGNS ARE BOTTOM ILLUMINATED

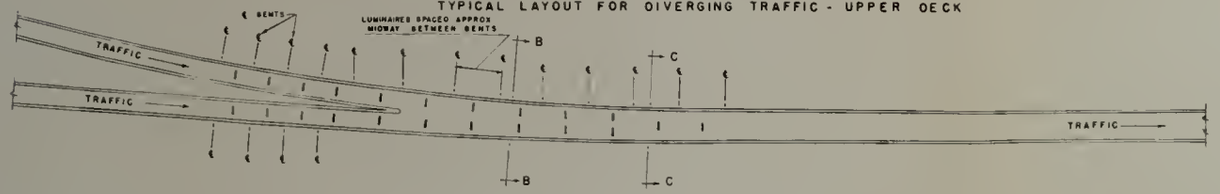
ELEVATION D-D

DIRECTIONAL SIGNS - LIGHTING

SCALE 1/8"=1'-0"



TYPICAL LAYOUT FOR DIVERGING TRAFFIC - UPPER DECK



TYPICAL LAYOUT FOR MERGING TRAFFIC - LOWER DECK

FREEWAY LIGHTING

FOR LUMINAIRE DETAILS - SEE DWG. NO E-3

SCALE 1" = 100'

LEGEND

- FLUORESCENT LUMINAIRE (LOWER DECK) WESTINGHOUSE TYPE FU-72, OR EQUAL.
- INCANDESCENT LUMINAIRE (UPPER DECK) WESTINGHOUSE TYPE AX 14 OR EQUAL SUSPENDED FROM LIGHTING STANDARDS
- DIRECTIONAL SIGN WITH SLIMLINE LUMINAIRE (UPPER DECK) COLUMBIA ELECTRIC TYPE 500-156-M4, OR EQUAL SEE TYPICAL LAYOUT
- DIRECTIONAL SIGN AT NOSE WITH SLIMLINE LUMINAIRE (UPPER DECK) COLUMBIA ELECTRIC TYPE 500-175-M6, OR EQUAL. SEE TYPICAL LAYOUT

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

FREEWAY LIGHTING
LOCATION PLAN AND ELEVATIONS
VICINITY OF REVERE AVENUE

DECEMBER 1955 DWG NO E-1

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN

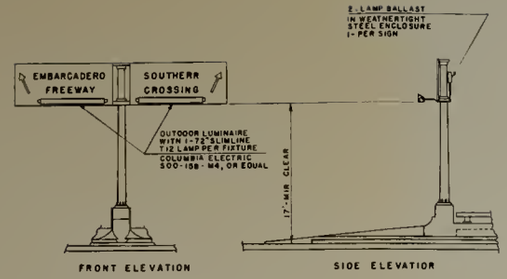
LEGEND

FLUORESCENT LUMINAIRE (LOWER DECK)
WESTINGHOUSE TYPE FU-72, OR EQUAL.

INCANDESCENT LUMINAIRE (UPPER DECK)
WESTINGHOUSE TYPE AK-14, OR EQUAL
SUSPENDED FROM LIGHTING STANDARDS

DIRECTIONAL SIGN WITH SLIMLINE LUMINAIRE (LOWER DECK)
COLUMBIA ELECTRIC TYPE 500-158-M4, OR EQUAL.
SEE TYPICAL LAYOUT.

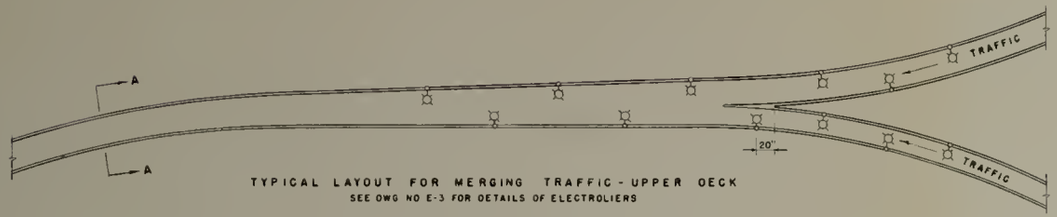
DIRECTIONAL SIGN AT NOSE WITH SLIMLINE LUMIRAIRE (LOWER DECK)
COLUMBIA ELECTRIC TYPE 500-175-M4, OR EQUAL.
SEE TYPICAL LAYOUT.



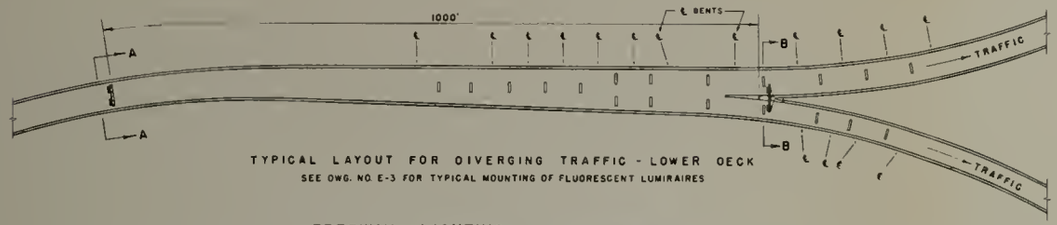
TYPICAL SIGN FRAME & SIGNS AT NOSE
WITH SLIMLINE LUMINAIRES - LOWER DECK
DIRECTIONAL SIGNS ARE BOTTOM ILLUMINATED

ELEVATION B-B
DIRECTIONAL SIGNS - LIGHTING

SCALE 1/8" = 1'-0" 0 8 16 24



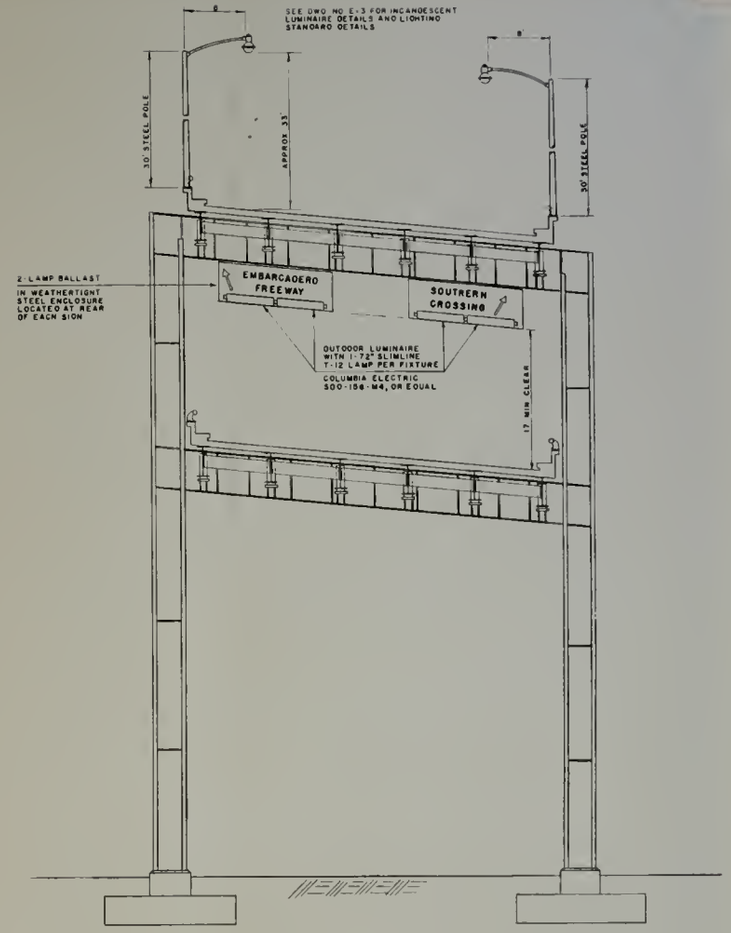
TYPICAL LAYOUT FOR MERGING TRAFFIC - UPPER DECK
SEE DWG NO E-3 FOR DETAILS OF ELECTROLIERS



TYPICAL LAYOUT FOR DIVERGING TRAFFIC - LOWER DECK
SEE DWG. NO. E-3 FOR TYPICAL MOUNTING OF FLUORESCENT LUMIRAIRES

FREEWAY LIGHTING

SCALE 1" = 100' 0 100 200 300



DIRECTIONAL SIGNS ARE BOTTOM ILLUMINATED

ELEVATION A-A
DIRECTIONAL SIGNS - LIGHTING

SCALE 1/8" = 1'-0" 0 8 16 24

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

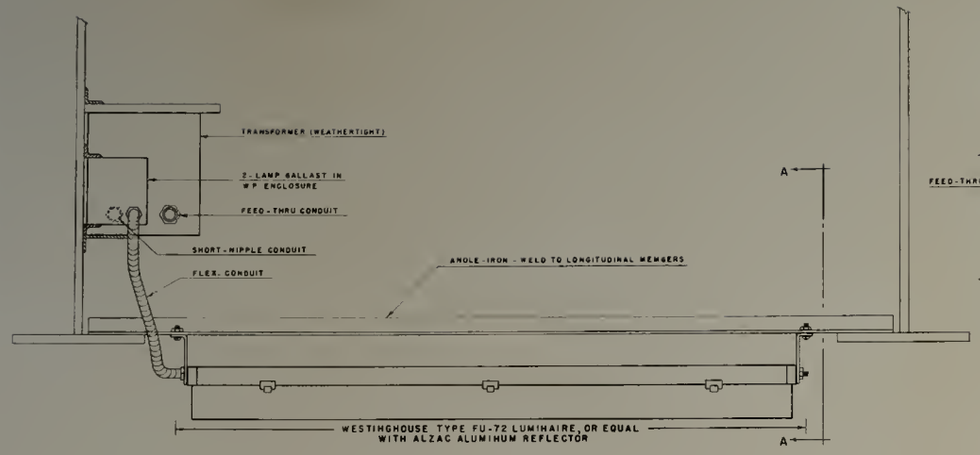
SOUTHERN FREEWAY

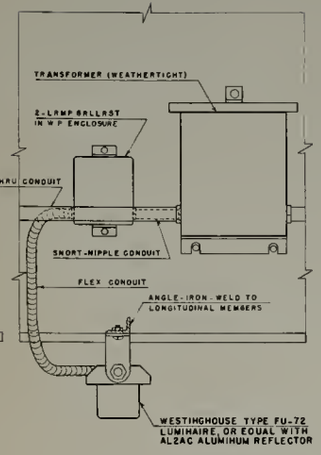
FREEWAY LIGHTING
FIXTURE MOUNTING DETAILS

DECEMBER 1955 OWG. NO E-2

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

NOTE THIS REDUCED REPRODUCTION IS NOT AT SCALE SHOWN





SECTION A - A

TYPICAL MOUNTING OF FLUORESCENT LUMINAIRES - LOWER DECK

FOR FLUORESCENT LUMINAIRE LOCATIONS - SEE OWG NO. E-1 ELEV B-B & C-C & OWG. NO. E-2

WIRING METHOD FOR FLUORESCENT LIGHTING - LOWER DECK

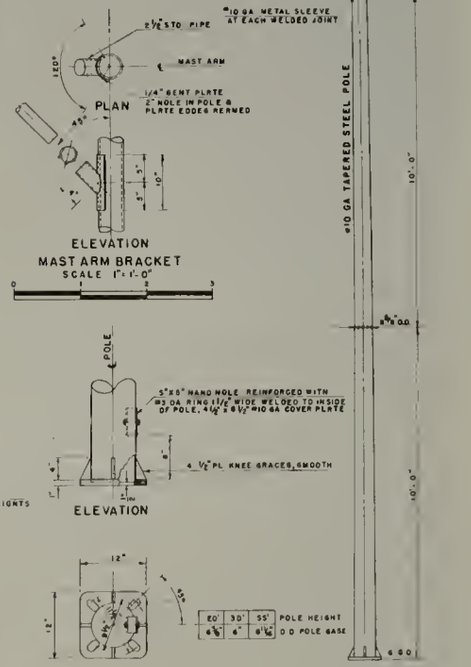
SCALE 1 1/2" = 1'-0"

4'-6'-8' MAST ARM

10'-12'-15'-18' MAST ARM

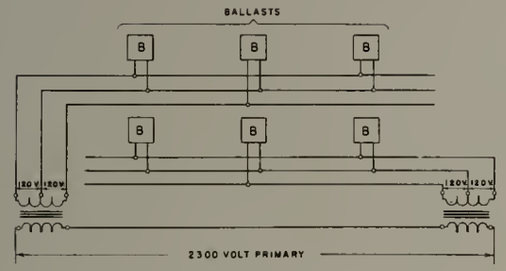
MAST ARM SCHEDULE

LENGTH	O	C	B	A	HORIZ. DIST TO BRACKET
4'	0 1/2"	2 3/4"	5 1/2"	12"	—
6'	0 3/8"	5 1/2"	6 1/4"	18"	—
8'	1"	4 7/8"	11"	2'-0"	—
10'	3 3/4"	13 1/4"	2'-6"	4'-6"	6'-3"
12'	5"	13 1/2"	2'-6"	4'-6"	5'-11"
15'	5"	12"	2'-0 1/4"	9'-0"	10'-5"
18'	5"	12 3/4"	2'-7 1/4"	8'-6"	12'-0"

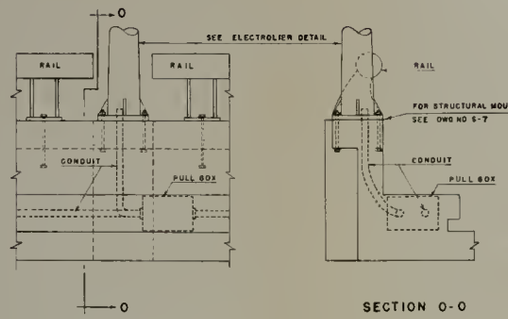

#10 GA METAL SLEEVE AT EACH WELDED JOINT
2 1/2" STD PIPE
MAST ARM
1/4" CENT PLATE
2" HOLE IN POLE & PLATE EDGES REAMED
PLAN
ELEVATION
MAST ARM BRACKET
SCALE 1" = 1'-0"
#10 GA TAPERED STEEL POLE
POLE
5"X8" HAND HOLE REINFORCED WITH #3 DA RING 1 1/2" WIDE WELDED TO INSIDE OF POLE, 4 1/2" & 8 1/2" #10 GA COVER PLATE
4 1/2" PL KNEE BRACES, 6 SMOOTH
ELEVATION
12"
POLE HEIGHT
O.D. POLE BASE
PLAN
LIGHTING STANDARD BASE
SCALE 1" = 1'-0"
ELECTROLIER
SCALE 1/2" = 1'-0"

TYPICAL MOUNTING OF ELECTROLIER - UPPER DECK

FOR LOCATION OF ELECTROLIER SEE OWG NO E-1 & E-2



TYPICAL SERIES-MULTIPLE TRANSFORMER CONN. DIAGRAM FOR LIGHTING OF FLUORESCENT LUMINAIRES

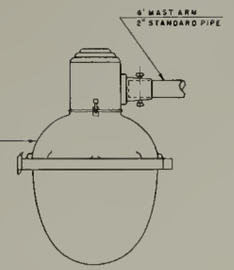


SECTION O-O

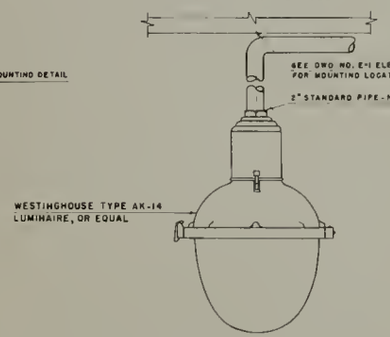
TYPICAL OPENING IN RAIL FOR STEEL POLE - UPPER DECK

WIRING METHOD FOR INCANDESCENT LIGHTING UPPER DECK

SCALE 3/4" = 1'-0"



TYPICAL INSTALLATION AT MAST ARM - UPPER DECK


SEE OWG NO. E-1 ELEV C-C FOR MOUNTING LOCATION OF STREET LIGHTS
2" STANDARD PIPE-NIPPLED
WESTINGHOUSE TYPE AK-14 LUMIHAIRE, OR EQUAL

TYPICAL INSTALLATION OF STREET LIGHT AT CROSS OVER STREETS - LOWER DECK

INCANDESCENT LIGHTING LUMINAIRE

SCALE 1 1/2" = 1'-0"

CITY AND COUNTY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

SOUTHERN FREEWAY

FREEWAY LIGHTING
LOCATION PLAN AND ELEVATION
VICINITY OF 26TH. STREET

DECEMBER 1955 OWG. NO. E-3

DE LEUW, CATHER & COMPANY - CONSULTING ENGINEERS - SAN FRANCISCO

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